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**A Review of the  
USDA-NASS Agricultural  
Prices Program:**

**CHALLENGES &  
OPPORTUNITIES**  
*for the*  
**21<sup>st</sup> CENTURY**

Coordinated by



Washington, DC | June 2009

A Review of the USDA-NASS  
Agricultural Prices Program:

# Challenges & Opportunities *for the* 21<sup>st</sup> Century

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**NOTICE:** The project that is the subject of this report was approved by the Council on Food, Agricultural & Resource Economics (C-FARE) Board of Directors. The members of the Review Panel responsible for the report were chosen for their special competences and with regard to appropriate representation. This study was supported by Contract/Grant Nos. 08-OA-2090-038 and 09-OA-2090-001 between C-FARE and the U.S. Department of Agriculture's National Agricultural Statistics Service (USDA-NASS).

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The Review Panel's task was made easier by excellent assistance from the C-FARE office. C-FARE's Executive Director, Tamara Wagester, arranged all the meetings, conference calls and financial matters, while maintaining a constant stream of communications and services to the Review Panel. C-FARE intern, Alison Rozema, provided assistance. Marie E. Lee served as the general editor of the report. Colleen Clancy McGinley provided graphic design and layout. NASS assumed responsibility for printing and distributing the report.

Four individuals chosen for their technical expertise and perspectives on agricultural prices reviewed the report in draft form. The purpose of these independent reviews was to provide candid and critical comments to help make the report as sound as possible and to

ensure that it meets accepted standards for objectivity, evidence and responsiveness to the charge. We wish to thank Richard Just, University of Maryland; Gene Nelson, Texas A&M University; Michael Sykuta, University of Missouri; and Robert Tortora, Gallup, Inc., for providing timely and independent external reviews. Although these individuals provided constructive comments and suggestions, responsibility for the final content of this report rests entirely with the Review Panel.

The members of the Review Panel deserve special commendation for their outstanding work under tight deadlines. Representing diverse interests and backgrounds, the Review Panel came together quickly to function as a team. They gave their time, energy and expertise to make this an insightful and useful document that will assist NASS in improving the content, procedures and outputs of the Agricultural Prices Program to the benefit of public policy and the American public.

In closing, we wish to acknowledge the leadership and organizational skills of John E. Lee Jr., who served as Review Director. Dr. Lee was diligent in guiding questions to the right person and coordinating the different responsibilities of the Review Panel. His knowledge and appreciation of U.S. agriculture and the importance of accurate price data provided by NASS were major factors in the success of this review.

Steve C. Turner, *Chair*

Gail L. Cramer, *Vice-Chair*

USDA-NASS Agricultural Prices Program Review Committee

June 2009





## Charge to the Review Panel

In April 2008, NASS asked C-FARE to assemble a panel of expert social scientists from academia, government and the private sector to conduct an “independent, comprehensive and objective review” of the NASS Agricultural Prices Program. The purpose of the Review was to identify the strengths and weaknesses of the Agricultural Prices Program and to recommend changes to make the published statistics more accurate and useful. Implicit in that purpose were two questions:

1. Is NASS doing things right?
2. Is NASS doing the right things?

The first question relates to technical and procedural issues involved in the collection, processing and dissemination of statistics on agricultural prices. The second is much broader and relates to the rationale and aim of providing price data, e.g., the uses and users of the data, frequency and form of publication and transparency to users of all aspects of the data sources, processes and products. To address those questions, the Review Panel examined the full range of activities related to agricultural prices in NASS, including program objectives, data sources, processes and products.

In addition to the charge from NASS, the Review Committee Chair charged the Review Panel as follows:

“Your responsibilities are both general and specific. In general you are to review all the input available to you carefully, including both written and oral information; identify issues, questions and opportunities that you

perceive; ask questions and pursue information necessary to clarify issues and problems; assist in classifying issues for purposes of categorizing and remanding them to appropriate sub-panels; and make suggestions and recommendations useful to improving the quality and success of the Review.”<sup>1</sup>

The three components of the NASS Agricultural Prices Program were the subject of this Review:

1. Prices received (for agricultural commodities);
2. Prices paid (for inputs to agricultural production); and
3. Price indexes (for prices received, prices paid and parity).

Sub-panels of the full Review Panel were organized around the preceding three components.

Each sub-panel prepared a report for its respective components of the Agricultural Prices Program with an evaluation and recommendations. The component reports are Chapters 5, 6 and 7 of the report. That division of labor notwithstanding, all evaluations and recommendations contained in this report represent the consensus of the entire Review Panel. Finally, in the course of its work, the Review Panel examined several common themes and generated several recommendations that either cut across the three component areas or pertained to more than one. These common themes and general recommendations are reported in Chapter 4.

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<sup>1</sup> Letter to Review Panel dated October 1, 2008.



The members of the Review Panel expressed their collective intent to provide recommendations that are actionable, substantive and consistent with sound economic and statistical principles. It is their belief that recommendations in this report follow the guidelines suggested by the National Research Council (NRC), as expressed in that Agency's *Principles and Practices for a Federal Statistical Agency*.<sup>2</sup>

For its part, NASS provided the Review Panel with data and any information requested, but NASS did not intervene in the Review Panel's deliberations. NASS also gave the Review Panel the freedom to consider issues not specifically included in the charge, but, at the same time, made it clear that NASS is constrained in its ability to respond to recommendations on issues outside the scope of the Review. For example, NASS is not at liberty to dictate policies to other agencies whose data are important to the NASS Agricultural Prices Program. Likewise, NASS has to respond to legal mandates, even in cases where the Review Panel felt the mandates no longer served their original purposes. Finally, NASS committed to publish this report without alteration or comment and make it available to the public.

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<sup>2</sup> Martin, Margaret E., Straf, Miron L. and Citro, Constance F., editors, National Research Council. *Principles and Practices for a Federal Statistical Agency: Third Edition*. 2005.







# Review Committee and Review Panel

**Steve C. Turner**, *Chair*  
Mississippi State University

**Gail L. Cramer**, *Vice-chair*  
Louisiana State University

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# Executive Summary

## The key findings of this Review are:

- NASS needs a fresh vision for the prices program.
- Fundamental improvements are needed in the conceptual basis for prices and price indexes.
- NASS must address the responsibility that goes with heavy dependence on data and indexes from other agencies.
- To address these needs, NASS must commit to a stronger program of future-oriented research to support the operations program.
- Increased transparency is essential to all aspects of the Agricultural Prices Program.



## BACKGROUND AND OVERVIEW

In April 2008, the U.S. Department of Agriculture's (USDA)<sup>3</sup> National Agricultural Statistics Service (NASS) asked the Council on Food, Agricultural & Resource Economics (C-FARE) to assemble a panel of expert social scientists from academia, government and the private sector to conduct an “independent, comprehensive and objective review” of the NASS Agricultural Prices Program. The purpose of the Review was to identify the strengths and weaknesses of the Agricultural Prices Program and to recommend changes.

The collection and publication of statistics on agricultural prices have a long history in USDA. Collection of prices received data began in 1866. Prices paid data were first collected in 1911, as USDA and the Congress began to examine economic conditions in the farm sector more closely. The collapse of agricultural commodity markets after World War I and the onset of the Great Depression in 1929 gave new impetus to analyses of the well-being of farmers and to the generation of statistics to support those analyses. At that time the concept of parity appeared. It established a relationship between prices received by farmers for the commodities they sold and prices paid for the inputs they purchased. The parity concept was used to define public policy objectives until the 1980s, in some cases. The inclusion of the concept of parity prices for farm commodities into the Agricultural Adjustment Act (AAA) of 1938, a permanent act, effectively mandated USDA and the

<sup>3</sup> Refer to Acronyms, pp. 55.

predecessor agencies to NASS to collect and publish statistics necessary to define parity indexes as well. Over the ensuing decades, coverage of commodities sold and of inputs purchased has expanded, and index base periods and item weights have been updated periodically. Because of the modernization of agriculture and changes in farm policies, the need to calculate parity measures, while still mandated by law, is no longer the primary reason for producing price statistics. Today, price statistics produced by NASS are heavily used in the administration of Federal programs, the calculation of various economic indicators, analyses of commodity markets and in a host of other ways by public and private users. Despite the critical importance of price statistics, they have had to compete for limited resources in recent years. It appears that price statistics have received lower priority than other more market sensitive commodity production statistics produced by NASS. It is in recognition of the need to reexamine and revitalize the Agricultural Prices Program that NASS requested this Review.

The three major components of the NASS Agricultural Prices Program were the subject of this Review:

1. Prices received (for agricultural commodities);
2. Prices paid (for inputs to agricultural production); and
3. Price indexes (for prices received, prices paid, and parity).

Sub-panels of the larger Review Panel were organized around these three components. Each addressed objectives and uses of the statistics, as well as statistical issues such as data sources, sampling, collection, processing, analysis and index construction. Considerable attention was paid to transparency and documentation of all aspects of the Agricultural Prices Program, including program purposes.

For its part, NASS provided the Review Panel with data and information requested, but did not in any way intervene in the Review Panel's deliberations. NASS also gave the Review Panel the freedom to consider issues not specifically included in the charge, but at the same time made clear

that the Agency is constrained in its ability to respond to recommendations on issues outside the scope of the Review. For example, NASS is not at liberty to dictate policies to other agencies whose data are important to the NASS Agricultural Prices Program. Finally, NASS committed to publish this report without alteration or comment and make it available to the public.

It is the intent of the Review Panel that the recommendations in this report, and the text which explains and supports those recommendations, be useful to NASS as it develops vision, purpose and content of the Agricultural Prices Program to meet the needs of the 21st century. All the recommendations are also intended to improve the quality of NASS price statistics.

## Common Themes and General Recommendations

Several common and important themes emerged from the Review Panel's deliberations on needed improvements in the NASS Agricultural Prices Program. For the most part, the common themes cut across all components of the Program. The themes pertain to:

1. transparency and documentation,
2. the critical importance of research,
3. the use of data from external sources,
4. NASS's response to changes in agriculture and demands of modern statistical systems,
5. the importance of specificity in defining attributes of items for which prices are collected, and
6. index construction (treated in Chapter 7).

## RECOMMENDATION 4–1

### **NASS should increase transparency and documentation of all aspects of its Agricultural Prices Program.**

NASS's data users should have easy access to understandable, up-to-date information on data sources, data collection methods, sampling methods, list completeness, processing and editing procedures, sources and magnitude of errors and changes in the industry that affect the collection and usefulness of the data. This applies to statistics that NASS publishes which are derived from data from other agencies, as well as



statistics based on NASS surveys. It is equally important that the purposes and conceptual basis for price statistics be apparent to users. NASS should clearly define formulas for calculating price indexes and terms used in calculations and document justifications for their use.

## **RECOMMENDATION 4–2**

### **NASS should substantially strengthen its core research capacity.**

NASS has a longstanding reputation as a supplier of dependable, objective and accurate statistics to the Federal government and to the American public. To continue its prominence, NASS should enhance its capacity to conduct and gain access to research to support its operations programs. The Review Panel noted that NASS’s research capability—once a source of public and professional confidence in the Agency’s statistics—has been diminished over recent decades. In the report, the Review Panel identified the need for more research expertise in index construction, information systems and data-collection methodology. To the extent possible, NASS should justify with documented research all substantial decisions about price collection procedures, use of data from external sources versus internal survey data and index construction methods. The documentation should include estimates of effects of these decisions on the accuracy of the statistics produced. Documentation and research are necessary to assure the use of up-to-date statistical methods and consistency across the Agency. It is important for Agency credibility, in that it allows academics and others outside the Agency to evaluate procedures and revisions. Increased transparency could also generate some supportive external research, e.g., by university faculty, if NASS establishes a working procedure for receiving and responding to input from such external research.

## **RECOMMENDATION 4–3**

### **NASS should accept full responsibility for how it uses, and explains the uses of, data from other agencies for calculating prices and price indexes.**

Other agencies, principally the Agricultural Marketing Service (AMS) and the Bureau of Labor Statistics (BLS),

are major sources of data used in the calculation of NASS price statistics. The prices for most livestock and livestock products and for most fruits, vegetable and specialty crops come from the AMS price reports. The statistical qualities of the AMS data are either unknown or not transparent. The total weight of items in the index of prices paid which come from AMS, BLS, ERS and DMRkynetec is 48 percent for the base survey month of April and 72 percent for other months. It was not apparent to the Review Panel that NASS had full access to, and made full use of, information on statistical properties of these external data, the nature and timing of changes and the appropriateness of uses being made of the data. The Review Panel recommends that NASS should establish an internal team that works on methodological and other issues related to the uses of prices from other agencies. Also, NASS should assume a leadership role in coordinating communications between NASS and other agencies producing data used by NASS. These suggestions imply that NASS should seek to better understand the price collection procedures of AMS and index construction concepts used in BLS and the implications of changes in those agencies’ procedures.

## **RECOMMENDATION 4–4**

### **NASS should undertake a comprehensive re-examination of its Agricultural Prices Program to develop a vision for a system of price statistics relevant to the emerging global food and agricultural economy and consistent with broader Federal and international statistical systems.**

Changes in farm production and marketing methods pose challenges to estimating prices received and prices paid. The emergence of new technologies and business practices in production and harvesting changes the mix and variety of inputs purchased and how they are purchased. This increases the complexity of coverage, weighting and collection of prices paid data. Vertical coordination and integration in the commodity marketing system make it increasingly difficult to determine farm level prices. Equally important, NASS should rethink the role of the price statistics program in





the context of its linkage to national and international statistical systems. With the introduction of the North American Industry Classification System (NAICS), NASS should consider its publication goals broadly within NAICS–Sector 11: Agriculture, Forestry, Fishing and Hunting. NASS should also consider producing price indexes both conceptually and mathematically compatible to the BLS Producer Price Index (PPI), for example, making it possible to combine indexes from the two agencies to produce a complete NAICS–Sector 11 index. In short, the world in which agricultural price statistics are compiled and used has changed, and that change must motivate a comprehensive reassessment of what the NASS price statistics program is all about.

### RECOMMENDATION 4–5

**NASS should address the issue of potential bias in its price estimates caused by lack of specificity in defining attributes of items for which prices are collected.**

NASS collects data on prices of items that are defined with varying degrees of generality. This opens the possibility of reported price changes coming from a change of attributes of the item or in the conditions of the transaction rather than from a change in the actual level of prices of items with precisely-defined attributes. Several recommendations in this report relate directly or indirectly to this concern. (See *Recommendations 5–1, 5–3, 6–1 and 7–3.*) The problem is illustrated in NASS’s practice of collecting expenditure and quantity data for calculating prices of broadly-defined commodities, products and input items. In contrast, AMS surveys collect actual reported prices for more narrowly-defined products, though not with probability sampling. NASS may have two conflicting objectives in the collection of price data. One is to collect prices that,

when multiplied by quantity, give total revenue or expenditures. This helps measure farm income, for example. But, if the objective is to measure price level changes, then prices should be collected for commodities or inputs with specific attributes that are held constant over time, while having a method of



dropping outdated items and adding new items, as BLS attempts to do with the Consumer Price Index (CPI). The Review Panel sees this as a critical issue for NASS to address, as it involves both program objectives and accuracy of reported statistics.

In addition to the common themes, the Review Panel offers three additional general recommendations for NASS’s consideration:

### RECOMMENDATION 4–6

**NASS should consider collecting and processing monthly prices received and prices paid so that they can be published early in the following month.**

Both prices received and prices paid statistics are used for making agricultural projections and for administering farm programs. One of the most important uses of NASS price data is for the monthly World Agricultural Supply and Demand Estimates (WASDE) Report prepared by the World Agricultural Outlook Board (WAOB). The WASDE Report is widely used and has a major influence on commodity markets. It is usually released on the 10<sup>th</sup>, 11<sup>th</sup> or 12<sup>th</sup> of each month. Currently, its price predictions rely on the full-month prices from two months earlier and the mid-month prices for the previous month. The Review Panel expressed concern that the mid-month price is subject to point-estimate sampling problems and may not be representative of overall price patterns. The recommended change would make full-month estimates from the preceding month available for WASDE and other uses. Mid-month prices for field crops would no longer be collected. Moreover, earlier availability of monthly average prices would be advantageous in the administration of farm programs. For example, Milk Income Loss Contract (MILC) payments could be made earlier if NASS’s monthly average prices for feed were available earlier. Any change in the schedule of reporting prices would have to be coordinated with WAOB and other users.

#### RECOMMENDATION 4–7

##### **NASS should seek balance between quality improvement efforts and assuring consistency of price statistics series over time.**

Historical data on prices and price indexes are valuable to policymakers, researchers and the general public. Consistency in the price statistics series is important to many users who follow price movements over time. Any changes in the methods used to collect data and calculate price statistics should be made as often as necessary to improve statistical quality. However, it is important that these changes be made deliberately and openly. When estimation methods change for a series, reports should provide information for splicing the new estimates onto older series. Consistency is required so the statistics are reliable ongoing indicators of price relationships. This recommendation is for transparency, not an argument against quality improvements. Any changes in data sources, quality characteristics or characteristics of data obtained from other agencies should be made transparent to users, along with information on how to interpret and value the changes.

NASS must continue to seek balance between users' immediate needs and the longer-term goal of improving the quality of the price estimates. It became apparent during the course of the Review Panel's deliberations that maintaining a consistent series to administer existing programs sometimes conflicts with the development of improved price estimates, which might contribute to better policies in the future. This can result from a lack of strong research on what the optimum price series should be. In cases where the data are required for administering programs, but viewed as not meeting best practices, NASS should develop a new series to replace the deficient series and then bridge the old and the new series to minimize disruption to users in the program agencies.

#### RECOMMENDATION 4–8

##### **On its website and in its publications, NASS should treat “agricultural prices” as a major subject and not as a sub-category of “Economics.”**

Identifying “agricultural prices” as a separate category would facilitate user access to information about the prices data (especially online) and would result in NASS combining information now shown under several topics. Also, the resulting higher visibility would be consistent with the Review Panel's view that agricultural prices are important and should be supported with a new vision and clarity of purpose.

##### **Prices Received for Farm Commodities**

NASS prices received statistics are critically important to the administration of many Federal farm programs. They are also required for the calculation of key economic indicators for the farm sector (e.g., farm income, commodity costs and returns and farm sector productivity), U.S. and world supply and demand estimates, important components of the National Income Accounts and the calculation of the parity ratio. Statistics on prices received for livestock have fewer apparent uses in the administration of Federal programs, but are important for all the other uses of statistics on prices received. Because prices received statistics are only reported monthly, they are not intended for short-term marketing decisions. For that purpose, AMS Market News reports are more useful. A key issue in the development of prices received statistics is the heavy dependence on price data collected by AMS.

#### RECOMMENDATION 5–1

##### **NASS should review, update and improve criteria for choosing between conducting probability surveys and using price data from AMS and other sources especially for those commodities not included in indexes.**

The use of data from probability surveys and from other sources in the same agricultural prices tables and the



same price indexes raises questions about the comparability and accuracy of the two data sources. The survey approach used for field crops provides greater assurance of complete coverage and allows measures of precision to be calculated. The use of price data from AMS is less expensive, and the monthly estimates appear less likely to be affected by monthly and annual changes in the attribute mix within a commodity. NASS should develop procedures for measuring the coverage and accuracy of monthly price estimates based on price data obtained from AMS and other sources. Such procedures should take into account completeness of coverage, bias and precision of estimates, users' needs for accuracy, the value of continuity in series, burdens on respondents and NASS's costs. There may be ways to work more closely with AMS to make their price data collection methods more compatible to NASS's needs.

### **RECOMMENDATION 5-2**

**NASS should track and evaluate quantitative measures of prices received data collection and processing operations to identify areas for improving the processes and resulting statistics.**

The prices received program currently tracks the estimated coefficients of variation (CVs) at the national level. Other quantitative measures that could be tracked include:

1. the proportion of reporters who fail to report in accordance with NASS standards;
2. rates and patterns of item non-response and unit non-response; and
3. edit failure rates for key items.

For each of these, the actual impact on estimates should be assessed. Tracking such measures will provide data for comparing performance over time. A periodic summary and review of changes in these error indicators will help identify points in the survey process in need of error reduction efforts.

### **RECOMMENDATION 5-3**

**NASS should review, update and improve the criteria used to determine commodity, state and attribute coverage.**

The development and implementation of new coverage criteria would serve to determine the overall scale of the price statistics program and which commodities and states to include at the margin. Currently commodities and states to be included for each commodity are determined every three years so that at least 90 percent of aggregate U.S. cash receipts are covered and each included commodity has 90 percent coverage. The 90 percent criterion is somewhat arbitrary. It should be reviewed from time to time and subjected to sensitivity analysis to determine whether and how large deviations from 90 percent would need to be in order to make a meaningful difference in application. In principle, commodities, states and attributes should be added or dropped at the margin depending on whether benefits to users of the statistics exceed the costs to NASS and respondents for generating the statistics.

#### **Prices Paid by Farmers**

Prices paid statistics are required for the calculation of parity measures, but may be more important for the calculation of farm income, farm costs and returns and other economic indicators, as well as for uses in the private sector. Data for producing prices paid statistics come from numerous sources, including NASS surveys, AMS, BLS, USDA's Economic Research Service (ERS) and private data companies. These data are largely for inputs used to produce traditional, economically important crops and livestock and livestock products. NASS surveys of prices paid are currently conducted annually. Until 2009, NASS surveyed prices for the month of April; now NASS uses March prices. The indexes of prices paid are reported monthly based on data from BLS, AMS and internal NASS sources.



## RECOMMENDATION 6-1

**NASS should address the goals and principles for changing the mix of inputs and selecting the attributes of items for which prices are to be collected.**

Profound changes in the agricultural sector require NASS to be vigilant in determining what input prices should be collected. Large commercial farms are becoming more specialized but in varied ways. Some purchase inputs in bulk, wholesale and not from traditional local retailers. At the same time, there has been an increase in organic farming and in production of other specialty crops and livestock. These likely use very different inputs and inputs from different sources than do large commercial farms. Some inputs become less commonly used or become used in different forms. NASS needs documented criteria for guiding coverage of input items for which data are collected.

The quality and other attributes of some inputs consumed in agricultural production change, sometimes dramatically, over time. For example, embedded technologies make seeds for many crops far more productive today than in the past. A given size or horsepower tractor may be very different and far more productive than a similar size tractor 30 years ago. These changes affect the meaning of price comparisons over time. Criteria should be developed for pricing attributes and for incorporating attribute changes into price series. In any case, attributes of items for which prices are collected should be carefully defined to reduce bias in estimates of price changes, i.e., to distinguish between price level changes and changes in attributes.

## RECOMMENDATION 6-2

**NASS should change to semi-annual or more frequent surveys of prices paid.**

Surveys in March or April to collect input prices may be relevant for major crops planted in the spring, but not necessarily for winter wheat or livestock-related inputs. It is not clear that the combination of annual price surveys with BLS-based monthly adjustments can adequately capture the monthly variability in input prices. A second survey period, perhaps August, September or October, would likely reduce the

adjustments needed in reported monthly prices paid statistics to bring them in line with survey data.



## RECOMMENDATION 6-3

**NASS should develop a research program in prices paid statistics that addresses critical problems in survey design, documentation and identification of appropriate input items to cover.**

Survey research is concerned not only with imprecision arising from sample selection and estimation, but also due to various non-sampling errors such as coverage, specification, measurement, non-response and with processing errors. The Review Panel suggests a need for further information in each of these areas. Specific suggestions are provided.

### Price Indexes

The Index of Prices Received (1910) and the Index of Prices Paid (1928) had their origins in attempts to develop simple, aggregate measures of prices received and paid. Over the ensuing years, items (commodities sold and inputs purchased) were added to both Indexes to provide coverage that was more complete. Also, the weights of items in both Indexes were periodically adjusted to reflect changes in commodities produced and inputs purchased. The parity index and related parity measures, based on prices paid and received, were developed in the 1930s as part of the effort to measure well-being of farmers. The years 1910–1914 were the original base reference period for all agricultural indexes used for U.S. farm support programs. Additional base periods and reference periods were established in the 1970s and updated in the 1990s, at which time 5-year moving average quantity weights were introduced. The Review Panel found little evidence of current official use of parity measures, so they were given less attention.

## RECOMMENDATION 7-1

**NASS should have a well-defined conceptual basis for its indexes.**

Well-defined concepts underlying and justifying price and index measures are useful to develop a strategy for



integrating changes in supply and demand into those measures on an ongoing basis. NASS should define what types of change it wishes to reflect in what time frame. Decisions about concepts of change do not have to be the same for both average prices and indexes, but consistency is helpful. New index concepts need to be researched and tested in parallel with existing indexes to permit bridging the old and new concepts to minimize disruption of official and other important uses of the indexes. Concern about disruption of ongoing official uses of existing indexes should not be a barrier to researching and testing improved indexes.

### RECOMMENDATION 7-2

**A high-level initiative should be undertaken to evaluate official and public interest in the continued calculation and frequency of publication of parity measures.**

A program should be initiated to contact users of parity prices and related measures to determine the desired frequency of publication and scope of the parity measures. This question should be discussed with appropriate USDA officials and Congressional staff. The responses by users to past changes made in the calculations of parity prices should be reviewed as a guide to how much flexibility NASS has within its legal requirements. The goal should be to minimize constraints imposed by the required parity calculations on improvements in the more heavily used prices received and prices paid measures. Finally, NASS should reduce its dependence on the requirement to calculate parity prices as justification of its Agricultural Prices Program. The recent submission to the Office of Management and Budget (OMB) for approval of the Agricultural Prices Program indicates that the collection of the price data is covered by U.S. Code Title 7, Section 2204 and

is not dependent on the legislation related to the parity prices.



### RECOMMENDATION 7-3

**NASS should evaluate alternative index formulations and revise the methodology used in construction of its indexes.**

The Review Panel carefully examined the calculations underlying the current construction of price indexes in NASS. It appears that the indexes now produced are not true price indexes. The Review Panel offers alternative calculations and provides examples to illustrate the potential for bias if price changes are not computed correctly. NASS should revise its methodology as soon as possible.

### RECOMMENDATION 7-4

**NASS should consider improving its data collection to include probability-based surveys for its indexes.**

In order to make an inference about a defined population, probability sampling should be used at all stages. For price index estimation, an overall measure should be estimated by weighting together sub-indexes for the finest level of detail desired for analytical or publication purposes. Probability-based mechanisms should be defined for selecting among all businesses which might sell or buy any of the items and for selecting specific items to be priced over time within a class. For each item stratum, the characteristics that are necessary to distinguish among all the items belonging to the stratum should be enumerated. The level of detail and extent of the “checklist” must be sufficient to insure that a current price for the exact same item at the same outlet can be obtained over time. The long-term problem of reflecting change in the universe of available items and outlets (e.g., the introduction of new technology or entirely new item classes) can be addressed by defining a schedule of sample rotation. While switching to all probability-based surveys for index components may be infeasible in the near-term for budgetary reasons, NASS should seek every opportunity to move in that direction.

## CONCLUSION

The Review Panel concluded that the NASS Agricultural Prices Program produces statistics and economic indicators that are critically important for many official and public uses. The program needs renewed attention to its purposes—a new vision and a reexamination of all its data collections and processes. A new vision for the program should be accompanied by full documentation and transparency of all aspects of the program, including the program’s purposes and underlying conceptual foundations. Decisions on improvements and new directions should be based on sound research, which will require strengthening the core research program and linkage with the larger research community. These recommendations are consistent with NASS’s history of continued improvement and reputation for professionalism and integrity.

By tradition, and by virtue of authorities delegated to it, NASS is USDA’s flagship statistical agency—one of a handful of key statistical agencies in the Federal government. These agencies provide the information base for much of public policy and for decisions which drive the nation’s economy. NASS’s status brings responsibility for leadership. One of those leadership responsibilities, as seen by the Review Panel, is to deal with the issues related to NASS’s heavy dependence on price data from other agencies, especially AMS and BLS. At a minimum, NASS should institutionalize a process for open communications among the agencies involved that is designed to bring transparency, documentation and understanding to all aspects of price data originating in one agency and used by others. Ultimately, this process should reveal opportunities for each agency to improve the quality of data it provides to others, while improving overall efficiency of the collective statistical system.

NASS’s response to these recommendations and challenges will determine the future relevance and usefulness of the Agricultural Prices Program. The Review Panel is confident that NASS has the will, competence and commitment to respond—to do the right things and to do them right. It is time to begin to develop a program of agricultural price statistics that meets the needs and opportunities of the 21st century.







## PART I | Background and Overview



### Chapter I

# Historical Perspective

The collecting and reporting of agricultural prices by the U.S. Department of Agriculture's (USDA) National Agricultural Statistics Service (NASS) include prices received by farmers for their commodities, prices paid by farmers for the production inputs they use and price indexes. The prices are estimated by surveying buyers of farm products and sellers of farm inputs and from data provided by other government agencies and sources. The price indexes are calculated from prices received and prices paid data as described later. While the price statistics have a long history, they compete with difficulty for resources with the more publicly visible and market-sensitive crop and livestock production reports, also issued by NASS.

Estimates of prices received by farmers for their commodities and prices paid for their production inputs have long been a staple of USDA's statistical activities. USDA reports that it began collecting and reporting prices received by farmers as early as 1866, shortly after the Department was established. The early reports covered December 1 prices received for ten crops. The collection of data to estimate January 1 values of six species of livestock began in 1867. Prices received (as of the first of each month) were collected in 1908 for eight crops. During the next two years, monthly prices received for livestock and poultry and their products were added. Policymakers and analysts became more interested in data on commodity prices as they watched the turbulence in the agricultural markets after World War I. The depressed farm conditions in the 1920s and 1930s increased their interest.

Throughout the 20th century, USDA's estimates of prices received for farm commodities evolved steadily with adjustments in collection methods, commodities covered and frequency and timing of reporting. The details of this evolution are chronicled in numerous reports and publications.<sup>4</sup>

Early in the 20th century, interest emerged in finding a simpler collective measure of prices received by farmers. Work in USDA's Bureau of Agricultural Economics (BAE)—the predecessor agency to NASS and the Economic Research Service (ERS)—led to construction of the first index of prices received. Beginning in 1910, the index was based on previous year prices for ten crops. A second index was published in 1918 incorporating livestock prices. The third series of indexes was published in 1921 and was based on prices received for 31 crop and livestock products. The base period for this series was August 1910 to July 1914, and the weights were based on Census of Agriculture (COA) sales for 1909.

As with prices received, the 20th century brought forth many changes in the index of prices received, such as the base period, the commodities surveyed and the weights. Throughout the century, NASS and its predecessor agencies tried to maintain continuity of indexes by extrapolating backwards any changes in concepts, commodity coverage and weighting periods.

<sup>4</sup> USDA-ERS. *Major Statistical Series of the U.S. Department of Agriculture: How They Are Constructed and Used*. Volume 1: Agricultural Prices, Expenditures, Farm Employment and Wages. ERS Agricultural Handbook No. 671, April 1990.

At the time of this Review, NASS reported that it publishes estimates of monthly prices received by farmers for about 60 important crop and livestock items and annual or marketing year average prices for about 60 additional items. Marketing year average prices are estimated for states where monthly estimates are not released because of limited marketing. Prices for fruit and vegetable crops for processing are estimated on a marketing year average basis because most production is sold under contract, and prices are not final until after the crop is delivered. NASS publishes the prices received by farmers and the price indexes each month in its *Agricultural Prices*.

The history of the collection and publication of statistics on prices paid by farmers and the calculation of an index of prices paid is similar to that for prices received for farm commodities. In an effort to quantify changes in the purchasing power of farm production, measures of the prices of farm inputs and family living expenses were developed. USDA conducted an inquiry on prices paid by farmers in 1911, based on prices of 86 farm production and family living items. These prices paid data were collected annually until 1923. Then, quarterly surveys were conducted through 1936. In 1937, the surveys were semi-annual, quarterly or monthly, depending on the item. Collection of separate prices for farm family living items was discontinued in 1976 in light of evidence that price changes for family living expenditures followed the pattern of the Consumer Price Index (CPI). Currently, NASS collects prices paid on 297 input items.

Analysts first used prices paid data to show the purchasing power of individual farm commodities. For example, they compared the number of bushels of wheat required to purchase a binder or the number of dozens of eggs required to buy a dress. Obviously, this early use of the prices paid data did not reflect farmers' purchasing power of farm products.

A composite measure of price changes, the index of prices paid by farmers, was first published in 1928 by USDA-BAE. The index measured changes in a selection of prices of items purchased by farmers. Just as for the index of prices received, the initial base period was significant for the

index of prices paid. In an effort to find a period when both prices received and prices paid were stable and the agricultural economy was judged to be "healthy," BAE undertook an extensive analysis of commodity and input price trends from 1891 through 1926. The period 1905–1915 exhibited relative stability. The most stable period, 1910–1914, was selected as the initial base period for the index of prices paid. Later, the Agricultural Act of 1949 adopted the 1910–1914 period as the original base reference period for all agricultural indexes used for U.S. farm support programs. (Since 1950, the index of prices paid and the index of prices received were put on the same base: January 1910–December 1914 = 100.)

Since the 1930s, revisions have been made periodically in weights and the number of items in the index of prices paid. In 1995, the index was re-weighted and reconstructed. The current index of prices paid has a base period of 1990–1992 = 100, as well as the 1910–1914 base. The weights are now assigned to a lagged five-year moving average of 84 (of 297) items for which data are collected by NASS. Currently, approximately 70 percent of the weights in the prices paid index are assigned to indexes of selected input items and services obtained from the Bureau of Labor Statistics (BLS) and other sources outside NASS.

Another component of the NASS Agricultural Prices Program—parity measures—evolved from the farm policy debates of the 1930s, when the nation and the agricultural sector were suffering through the Great Depression. As noted previously, analysts and policy-makers examined the relationships between prices received and prices paid to try to understand changes in the economic well-being of farmers and farm families. Parity prices for farm products were first defined by the Agricultural Adjustment Act (AAA) of 1933. The Act declared it to be the policy of Congress to reestablish prices to farmers at a level which would give agricultural commodities a purchasing power with respect to articles that farmers buy, equivalent to the purchasing power of agricultural commodities in a base period. The 1910–1914 period was chosen as the base because it was considered a relatively normal period with generally stable price relationships.



For many years, the parity concept was cited as an indicator of the need for government intervention in agricultural markets, but its operational effectiveness declined rapidly after World War II. Rising farm productivity and the liberalization of agricultural trade in the 1960s and 1970s led to more flexible farm support programs. These programs reflected the modernization and industrialization of American agriculture. The most recent farm acts do not mention parity. However, the parity requirement is still embedded in permanent legislation, although it is widely considered as anachronistic. Still many provisions of recent farm acts are temporary suspensions of permanent legislation, meaning that parity prices continue to have a potential role in the determination of agricultural support policy. This potential ensures a continuing interest by the Congress and farm leaders largely in reference to contingencies, such as the expiration of temporary laws, or a basis for setting farm support prices in case of trade embargoes and other food emergency conditions.

Mathematically, the parity index is the ratio of the general level of prices farmers pay for the production goods and services they buy today compared with the general level of such prices in the 1910–1914 base period. When the index of prices received by farmers for the products they sell is divided by the parity index (which is essentially the index of prices paid plus wages paid to hired farm labor, interest on farm indebtedness secured by farm real estate and taxes on farm real estate), the resulting parity ratio provides an indication of the per unit purchasing power of farm commodities generally in relation to the purchasing power of farm products in the 1910–1914 base period. At any given date, the parity price for any agricultural commodity is determined by multiplying the adjusted base price of that commodity by the parity index. (Parity prices are computed under the provisions of Title III, Subtitle A, Section 301(a) of the Agricultural Adjustment Act of 1938 as amended by the Agricultural Acts of 1948, 1949, 1954 and 1956.) Since parity calculations were begun in the 1930s, numerous studies have focused on modifying the parity concept and the calculations underlying it.<sup>5</sup> It is important to note that, because of

the many changes in the agricultural sector since 1910–1914, the parity ratio is no longer a meaningful measure of farm income, farmers' purchasing power or farmers' welfare.



Two other historical developments may be pertinent to this Review: First, in recent decades NASS's agricultural price statistics have received less public scrutiny than commodity yield and production statistics. Also, additional responsibilities were transferred to NASS, including the Census of Agriculture. As a result, agricultural price statistics, by default, have received fewer resources for maintenance and research.

The second development is that other USDA agencies are also charged with estimating prices and price statistics for a wide variety of program and policy purposes. For example, the Agricultural Marketing Service (AMS), under the Agricultural Marketing Act of 1946, reports daily prices for a wide range of commodities and markets, using definitions and survey techniques that are quite different from those used by NASS. The Farm Service Agency (FSA) collects data on prices from a variety of sources to administer a number of programs. By some counts, there are now more than a dozen sources of price data within USDA, with various combinations of sources used by agencies for specific program purposes.

The tight funding for NASS prices collection and reporting and the existence of multiple price reporting efforts within USDA raise issues about duplication, inefficiency and the potential for misinterpretation and misuse. Communication and collaboration among agencies producing agricultural price statistics are subjects for further examination, especially since there are numerous data issues involved that cannot be solved by NASS alone.

<sup>5</sup> Tiegen, Lloyd D., *Agricultural Parity: Historical Review and Alternative Calculations*. AER-571. June 1987. U.S. Department of Agriculture, Economic Research Service.





## Chapter 2

# Objectives, Uses and Users of NASS Price Statistics

### OBJECTIVES

An examination of the uses and users of NASS price statistics and the wording of the authorizing legislation suggest that the objectives of the program are twofold: to provide essential data to meet the requirements of Federal legislation; and to provide data essential to understanding the economic well-being of the agricultural sector and its contribution to the national economy. The implementation of numerous Congressionally-mandated programs now depends on data provided under the first objective. The fulfillment of the second objective provides a public record on farm prices, the value of farm production, farm income, farm expenditures and the relative well-being of farm operators. Such data enable analysts and members of the public to track the performance of the farm economy and quantify the contribution of the farm sector to the larger economy.

### USES AND USERS

It is difficult, of course, to identify all the uses and users of any publicly available body of statistics. This is especially the case for NASS prices received and prices paid statistics, which have been published for many years. It would seem to be a simple task to identify legally-mandated uses, but that is not always easy either, especially where those legal mandates trace to legislation enacted long ago and kept on a standby basis. It is more difficult to track uses of NASS price statistics to meet legislated policy objectives that presume the availability of the data. Then there is the dependence on price data to produce other estimates, reports and analyses for which there may not be a specific legal

mandate, but on which policymakers and others have come to depend.

Additionally, countless people and businesses worldwide use NASS price statistics directly and indirectly for purposes that can never be fully known. Some fairly common uses are noted in the following examples of uses and users:

**Legal Mandates.** The Agricultural Act of 1949 mandates the calculation of parity prices, indexes and ratios. Prices received and prices paid data are effectively mandated because both are required to calculate parity prices. Even though the most recent Farm Act does not specifically mention parity, the Act is a temporary suspension of permanent legislation—the Agricultural Act of 1949. Moreover, as long as there are farm price and income support programs, legislators and farm organizations, among others, will exert pressure on USDA to continue to calculate parity prices.

NASS price statistics are used to implement several programs mandated by The Food, Conservation and Energy Act of 2008, the most recent Farm Act. Similarly, NASS price statistics are used to fulfill the mandates of other legislation.

- NASS weighted marketing year (season average farm) prices are required to determine levels of Price Counter-Cyclical Payments (PCCP).
- NASS weekly peanut prices are considered in establishing the National Posted price or alternative loan repayment rate for peanuts.
- FSA uses a variety of data sources to calculate daily posted county prices (PCPs) used to determine

loan deficiency payments for grains and soybeans. FSA does not use NASS monthly state level prices received directly in their PCP calculations, but notes them as one of several checks on the reasonableness of their daily county estimates.

- NASS season-average farm commodity prices are needed to calculate crop revenue under the new Supplemental Revenue Assistance (SURE) program.
- National marketing year average (MYA) prices or season-average commodity prices received for specified crops—averaged for the previous two years—are required to calculate payments under the new Average Crop Revenue Election (ACRE) program.
- NASS price statistics are essential to ERS's development of Congressionally-mandated annual estimates of commodity costs and returns. Congress has also requested that ERS set monthly estimates of milk cost of production, for which the monthly index of prices paid, published by NASS, is required.
- NASS monthly and season-average prices of non-price supported commodities (e.g., fruits, vegetable and livestock products) are often used as a basis for allocating so-called Section 32 funds. For example, in response to low prices, the Secretary of Agriculture may announce that USDA is going to purchase a specific commodity with Section 32 funds for donation to domestic food assistance programs.
- The Risk Management Agency (RMA), which oversees the crop insurance programs, uses NASS prices received series for over 40 fruits, vegetables and other minor/specialty crops for determining the price election that is used in establishing the insured producer's guarantee. For tobacco and cherries, NASS prices received data are used for determining indemnities, as well as the settling of claims. Prices received are also used to settle claims under the new Actual Revenue History (ARH) pilot insurance program, used currently for cherries. The ARH program may be expanded soon to include other crops like California citrus, dry peas, sugar beets and lentils.



**Other Government Uses and Users.** Officials from several USDA agencies testified to the Review Panel that they depend heavily on NASS price statistics to conduct analyses of policy and program options.

- Price data are used heavily by USDA's commodity market Situation and Outlook program, coordinated by the World Agricultural Outlook Board (WAOB) to analyze market conditions and forecast commodity supply and demand, carry-over stocks, domestic and foreign utilization and trade.
- The indexes of prices paid and prices received are key components of the data base for USDA's Farm Income and Financial Indicator Accounts produced by ERS.
- ERS uses the NASS index of prices received and index of prices paid in the development of USDA's annual indexes of agricultural productivity and productivity growth.
- USDA's Commodity Credit Corporation (CCC) uses NASS monthly and season-average prices to estimate and forecast CCC outlays, which are included in forecasts of the Department's and Federal expenditures.
- The index of prices received for beef is used by USDA and the Bureau of Land Management (BLM) in the calculation of grazing fees on public lands.
- Prices received for corn, soybeans and hay are used to calculate the National Average Dairy Feed Cost, a component in the formula used to administer a monthly, direct payment to dairy producers under the Monthly Income Loss Contract (MILC) program. Payments are based on dairy feed costs relative to Class I milk prices.
- The Congressional Budget Office (CBO) uses NASS commodity price data to estimate likely budget outlays for various agricultural programs, actual and proposed.
- The Bureau of Economic Analysis (BEA) in the U.S. Department of Commerce makes multiple uses of NASS price statistics.
  - BEA's National Income Accounts use the price data to estimate agriculture's contribution to Gross Domestic Product (GDP) and



national income and to estimate the real consumption of food on farms and CCC inventory change components of GDP.

- BEA's regional accounts use agricultural price data to derive the annual regional estimates of farm proprietors' incomes, which, in turn, are used by other agencies to administer programs that distribute over \$214 billion in Federal funds to state and local areas. These funds markedly affect economic well-being in some 400 rural counties.
- BEA is currently examining the possibility of using monthly or quarterly data on prices received from NASS to estimate farm proprietors' income on a quarterly basis.

**Public and Private Uses and Users.** NASS states, "Estimates of agricultural prices ... are an important part of the nation's economic data base. They are used by industry management, economists, farmers, farm organizations, legislators and government officials for analysis ...."<sup>6</sup>

Members of the Review Panel, staff from USDA-NASS and industry representatives provided the following examples:

- Private commodity and farm advisory services track monthly price reports to anticipate levels of government support for commodity producers and to provide production and marketing guidance to farmers.
- Farm input suppliers and manufacturers track USDA prices as part of the process of anticipating sales, stocking inventory and supplies and planning further production.
- Land Grant University Extension economists use NASS prices to develop commodity budgets, build decision models for farmers, calculate value of agricultural production for their states and calculate agriculture's contribution to the states' economies. Numerous other purposes were mentioned by these users.

- Prices received and prices paid (along with futures prices and other prices information) are sometimes used by tenants and landlords in setting land rental rates.
- NASS's index of prices received and index of prices paid are reportedly used to adjust prices paid to producers under long-term contracts with food processors.
- Farm and commodity organizations use NASS price statistics for tracking the economic conditions faced by their members, advising their members and developing policy proposals and lobbying positions.
- Most of the NASS Field Offices have close working relationships with their state's Department of Agriculture. They supply those departments with statistics, including state commodity and input prices, to support the state's monitoring of economic conditions within their agricultural sectors.



## NASS AGRICULTURAL PRICES PROGRAM IMPACTS

A brief review of programs and their administrative requirements and of price statistics used by public and private entities suggests those statistics guide and influence decisions involving billions of dollars. Thus, the impact of the NASS Agricultural Prices Program is significant as illustrated in the following examples:

- NASS estimates of marketing year average (MYA) prices received will be used to calculate support payments to farmers under the Food, Conservation and Energy Act of 2008, the current Farm Act. Thus, the accuracy of these estimates is very important as small errors in the estimates of commodity prices can be costly for taxpayers or commodity producers. For example, producers of certain commodities are eligible for income assistance under several provisions of the 2008 Farm Act.

Under the Price Counter-Cyclical Payments (PCCP) provision, income payments are made when market prices of specific commodities are in

<sup>6</sup> USDA-ERS. *Major Statistical Series of the U.S. Department of Agriculture: How They Are Constructed and Used*. Volume 1: Agricultural Prices, Expenditures, Farm Employment and Wages. ERS Agricultural Handbook No. 671, April 1990.



a range determined by legislated formulas. For some basic commodities, the PCCP payment is made on the amount of production determined by multiplying that commodity's base acreage times historic yields times 85 percent.

At the market price ranges at which farmers are eligible for payments, a one cent (\$0.01) error in the marketing year average (MYA) price estimate can make a difference of approximately \$85 million in government payments for corn, \$23 million for wheat and over \$101 million for upland cotton.

Considering the possibility of larger errors across numerous crops, it is clear that hundreds of millions of taxpayers' dollars depend upon the accuracy of NASS prices received estimates for farm commodities under this single provision of the current Farm Act.

- Similarly, small changes in prices received estimates for corn, soybeans and hay can drive changes in Federal direct payments to milk producers that amount to millions of dollars under the Monthly Income Loss Contract (MILC). NASS prices received estimates for these three dairy feed ingredients are a key component in the formula used to administer the MILC program as payments are based on dairy feed costs relative to Class I milk prices.
- As noted previously, BEA of the U.S. Department of Commerce uses NASS price estimates to calculate regional farm proprietors' incomes, which become part of the formulas used by other agencies to distribute billions of Federal dollars to states and local areas, including some 400 rural counties.
- A large national food company reports using the NASS index of prices paid to adjust the prices it pays farmers for potatoes to offset changes in costs of production. These adjustments alone—based on NASS prices—can amount to several million dollars per year.

In short, the financial well-being of millions of individuals and businesses is affected in significant ways by the many decisions, large and small, which depend on the NASS Agricultural Prices Program. The billions of dollars in impacts driven by these decisions contrast sharply with the approximately \$5 million dollars that NASS allocates annually to produce the prices estimates.<sup>7</sup> This contrast begs the question of whether NASS could improve its Agricultural Prices Program within that resource base. The Review Panel hopes that this report starts to answer that question.



<sup>7</sup> Information emailed by Kevin Hinsman, NASS, April 16, 2009.



## Chapter 3

# Current Issues and Challenges

The Review Panel identified several issues and challenges as part of its examination of the NASS Agricultural Prices Program. Some issues are technical, some policy-related and others related to the nature of agriculture itself.

### CHANGES IN THE AGRICULTURAL ECONOMY

Until recent decades, there may have been a perception on the part of economists and statisticians that price data were relatively accurate and easy to compile in an agricultural economy regarded as a close approximation of Adam Smith's world of perfect competition. More recently, however, the dramatic increase in contractual sales and vertical integration and the pervasive effects of technology and intellectual property on the concentration of input industries (e.g., seed and pesticides) have brought increases in both the importance and difficulty of compiling good price data.

- The changing organization and structure of the food industry, especially vertical coordination and integration, have blurred the lines between stages of the food chain. This raises questions about the identification and meaning of “farm-level” prices. For example, there are no “farm-level” prices for chickens; the first prices established are those for processed chicken products at the wholesale level.
- Similarly, prices received for crops are collected from “first purchasers,” not from farmers. Consolidation (of grain elevator ownership, for example), integration of once-local purchasers into higher stages of the food chain and proliferation of types and ownership of buyers make it more

difficult to identify when and where a sale takes place.

- Numerous and increasingly sophisticated marketing contracts are used for selling farm products, which make it difficult for NASS to determine the dates and prices at which a transfer of ownership takes place. The challenge is that there is a separation between pricing and delivery (ownership transfer), which makes it difficult to determine the appropriate observation point for the transaction. Producers use a variety of pricing mechanisms and set prices for various portions of their products at various times throughout the production cycle. This can affect the month to which transactions are assigned and distort the resulting statistics. The challenge to NASS is to find ways to minimize errors in making such assignments.
- In some transaction contexts, it is not always obvious what the producer is being paid for and therefore whether (or how much of) the received price is for an agricultural product or for a managerial service. The case of broilers is one example (and some other livestock would be similarly involved), but the issue extends to identity-preserved production and marketing contracts more generally where producers are paid premiums based on compliance with certain management activities over and above the price for the actual commodity. Some contracts specifically separate the pricing of the commodity from the pricing of the attribute premium; others do not. How are these different prices and attributes reflected or captured in NASS price data?

- U.S. agriculture is now integrated into the global economy. Global supply and demand, trade policies and exchange rates affect commodity and input prices. Trade issues and policies influence the demand for, and use of, price statistics. Closer global coordination of trade and food policies (under WTO, for example) increases the value of consistency in statistical conventions and methods for purposes of cross-country comparisons. Shifts in global consumer demands and international flows of technology drive changes in the attributes of agricultural products and inputs.

These changes in the domestic and global agricultural economy have implications for the nature of price statistics most useful to the various users. They also pose challenges to the collection and utilization of price data to produce price statistics.

## CHANGES IN DEMAND FOR COVERAGE

Changes in the use of price statistics affect expectations of users about the commodities and input items for which price statistics are available and which are included in published indexes.

- Collection of data for prices received now extends beyond the original basic commodities. Yet, not all crops (e.g., many specialty and minor crops) are included. What criteria should guide the selection of commodities for inclusion in prices received statistics beyond those commodities required to compute parity or those needed for administration of government support programs? How much of the production of those crops should be included?
- Not all products and services used by commodity producers are included in estimates of prices paid for various reasons such as uniqueness, infrequency of use and the expense of finding data. Is this an important issue? What criteria should guide NASS's decisions on which production items to include in prices paid and the index of prices paid?

## CHANGES IN ATTRIBUTES OF COMMODITIES AND INPUTS

As uses of price statistics become more sophisticated, and as technology brings more rapid changes in the mix of product characteristics, more attention is focused on exactly what is being priced.

- Factors such as quality, utilization, seasonal varieties and movement of old and new crops affect month-to-month price changes. Thus, a comparison of month-to-month price changes may not reflect changes in prices for identical products each month. This can lead to bias and error of the estimates of prices and price indexes.
- Many of the prices reported by NASS represent products with a range of specifications that are aggregated into a single price estimate. Differences in variety, grade-weight class, protein level and organic versus non-organic are examples. How different or unique should a product be to receive separate treatment? For example, should corn grown for ethanol under a fixed price or premium price contract be treated as a separate commodity? The point is that corn with a given set of attributes may be priced differently from corn with another mix of attributes. In that case, as an example, price changes reported for generic "corn" could result from a change in supply and demand or a change in the mix of attributes being priced, or both. Generic prices may be valid for estimating aggregate farm revenue, but price indexes require prices for commodities with well-defined attributes.
- Similarly, the mix and quantities of input items and services that farmers buy and the qualities and attributes of those items change over time, sometimes rapidly. For example, how does one compare the price of cotton seed today—with all the technology now embedded in such seed—with the price of cotton seed in earlier times? Moreover, the rapid changes in technology and the proliferation of attributes (choices) present challenges to NASS in terms of what input items to report and how to ensure comparisons of prices of like items over time.



- Many varieties of fertilizers, pesticides and feed mixes are customarily prepared and sold. NASS groups these items by category for reporting prices paid and for weighting in indexes. The prices of items within a category may not change in concert. For example, prices of nitrogen fertilizers may be rising rapidly while prices of other fertilizers may be rising more slowly or declining. As a result, the aggregated fertilizer component of prices paid may not reflect current market developments for, say, farmers who use mostly nitrogen. The usefulness of prices paid statistics and indexes is affected by the fact that changes in component prices and weights do not always reflect the price movements of some items within that category. What criteria should guide NASS in determining how far to go in disaggregating groups or categories of prices paid items?

## SOURCES OF DATA

In most cases, more than one possible source of data exists for prices received or prices paid. Some of these sources are other government agencies, particularly AMS and BLS. Some sources are private price reporters. Efficiency considerations and budget constraints suggest the need to evaluate these alternative sources as substitutes to, or additions to, collecting data by NASS surveys.

- NASS now uses probability surveys to estimate prices for selected field crops, defined generically. AMS uses non-probability surveys to collect prices of well-defined products in selected markets. How important is it for NASS price statistics to be unbiased estimates with known precision of population means? How difficult would it be to evaluate the trade-offs between the strengths and shortcomings of NASS and AMS price data to minimize bias in price estimates? What criteria should guide the choice or mix of data sources used?
- The demand for more complete coverage of commodity and input prices and the growing dependence of NASS on other agencies for data to provide that coverage challenge NASS's role as the flagship statistical agency of USDA. Currently, NASS lacks full information about, and understand-

ing of, the characteristics of price data from AMS and other sources and indexes from BLS. NASS also is not

always aware of changes in data and indexes from external sources, which can affect the quality of NASS price statistics. It appears that NASS has been a rather passive user of external data, having exerted little influence on the qualities, characteristics and timing of data provided by other agencies. NASS may have to assume more responsibility for inter-agency communication and coordination to:

1. encourage other agencies to develop data more consistent with NASS's needs,
2. become more informed of qualities and changes in price data collected and/or provided by others (to improve and document NASS's own published statistics), and
3. help develop and improve the vision and goals for its own price statistics program.

The changes in the economic and statistical environment in which NASS now manages its programs make the issue of NASS leadership very important.

## THE CHANGING DEMAND FOR PRICE STATISTICS

Agricultural price statistics were first collected to inform farmers and to provide those interested in agriculture with some general indicators of economic conditions in what was once the nation's largest economic sector. Later, in the 1930s, the legislated requirement for parity calculations added to the importance of collecting and publishing price statistics. There were few other sources of price data, and little, if any, formal or informal connections of USDA statistical programs to other Federal statistical programs and economic indicators. In those earlier decades, there were few international statistical regimes or standard statistical conventions. Today, there are many sources of data on agricultural prices, even within USDA. The interdependence of statistical indicators generated by NASS, BLS, BEA and others increases the pressure for statistical compatibility and more standardized statistical concepts and conventions among the domestic



statistical agencies. The same is increasingly true for the international statistical community, of which NASS is an important member. In this changed and more complex market for price statistics, the Review Panel feels it is important to take a fresh look at the needs for and uses of price statistics and the attributes of those statistics that are important to users. As examples, it is important to address price statistics issues such as:

**Transparency.** Many data users want and need more information about all aspects of data collection, processing, analysis, degree and sources of bias and error, and index content, weights and construction. This applies to external data as well as that collected by NASS. Transparency requires a full commitment to documentation and ease of access to that documentation.

**Compatibility and Comparability.** It is important to view the NASS Agricultural Prices Program today as an integral part of the body of Federal statistics. Thus, it is important to think about consistent, or at least compatible, conceptual bases for the various statistical products, including indexes, that become components of statistical products produced by other agencies. International comparability is also important. Again, transparency and widespread understanding among the various statistical agencies are critical to progress toward compatibility.

**Timing.** What time period should commodity prices cover? What are the arguments for monthly estimates rather than some other time period? Are preliminary mid-month estimates of prices received useful and to whom? Could the timeliness of monthly price estimates be improved and costs reduced by eliminating the mid-month price estimates? What uses and which users would be affected?

**Education.** Once price data, or any other statistics, become regularly and publicly available, USDA and NASS have little control over their uses. For example, there are reports of published prices received being

used to set land rental rates by landlords even though commodity prices are not necessarily an indicator of the profitability of land use. Should NASS be responsible for educating the public so they will know how the statistics are created and how to interpret them?

**Legal Constraints.** Does the “parity” concept, hence the computation of parity prices and indexes, have any current validity? How would de-emphasis of the legal mandate for parity computations relative to greater emphasis on the mainstream price statistics program improve the flexibility of NASS to address program changes to meet today’s needs? This is an issue over which NASS has no direct control and would require guidance from higher policy levels.

In summary, rapid changes in today’s world result in many challenges to managing a major agricultural statistics program. They also provide context for this review of the NASS Agricultural Prices Program. The Review Panel has addressed several of the most critical of these challenges in the following chapters.



## PART 2 | Reports and Recommendations of the Review Panel



### Chapter 4

## Common Themes and General Recommendations

Several common and important themes emerged from the Review Panel's deliberations on needed improvements in the NASS Agricultural Prices Program. For the most part, the common themes cut across all components of the Program. The themes pertain to:

1. the value of improved transparency and documentation,
2. the critical importance of research,
3. the use of data from external sources,
4. NASS's responses to changes in agriculture and demands of modern statistical systems,
5. the importance of specificity in defining attributes of items for which prices are collected, and
6. improvement of index number construction (treated in Chapter 7).

The Review Panel also offers additional recommendations that are more generally applicable to the Agricultural Prices Program.

### RECOMMENDATION 4-1

**NASS should increase transparency and documentation of all aspects of its Agricultural Prices Program.**

NASS's data users should have easy access to understandable, up-to-date information on data sources, data collection methods, sampling methods, list completeness, processing and editing procedures, levels and sources of errors and data interpretation. Such information should be updated annually, or more

frequently, as needed. All data revisions should be clearly identified to enable users to correct any series they are using. This applies to statistics that NASS publishes which are derived from data from other agencies, as well as statistics estimated by NASS surveys. Increasing transparency and documentation for the Agricultural Prices Program would meet NASS requirements as stated in its *Information Quality Guidelines*.

It is equally important that the purposes and conceptual basis for price statistics be apparent to users. For example, prices received and prices paid data, while required for parity calculations and for administration of some programs, are essential to calculation of real value added by the farm sector in the national income accounts. This value-added concept is one determinant of the coverage of farm expenditures, as well as coverage of prices received for the entire range of products of the farm sector. When (if) calculations of price measures to conform with legal mandates conflict with other conceptual bases (e.g., national income accounting) or sound statistical theory (e.g., index construction), those conflicts and how NASS addresses them should be readily transparent. A major benefit to NASS of documenting the conceptual basis for price statistics is that doing so provides the Agency opportunity and incentive to clarify those conceptual issues for internal management purposes.

NASS provided several excellent manuals describing sampling, data collection and processing. However, many users of statistics are more interested in a better



understanding of what the data represent than on how they are collected. The Review Panel's suggestions on improvements in transparency range from including a guide to how NASS incorporates various sources of price data to providing a citation index for sources.

Statistical organizations document their procedures in order to communicate what they do and how they do it. Part of this is documenting an agency's statistical standards. Some agencies have manuals of statistical standards to facilitate a bigger and more consistent cross-surveys perspective. Such communications can be internal, such as employee training or program management, or external, such as for legal reasons, answering questions from statistics users and recruiting staff or to provide advice to or obtain advice from other statistical organizations. Documentation that discusses the software used to carry out statistical procedures can be helpful for internal communications about statistical procedures, but it generally does not facilitate effective external communications.

The Review Panel recommends that NASS prepare documentation of its statistical procedures on a regular basis for purposes of effectively communicating with external stakeholders. The documentation should be free of reference to software familiar only to NASS or specialized data users.

The information about how price data are collected should be readily available to users and include the tools to find the information (e.g., searches within the NASS website). Although the statistics in the hard copy reports include references and notes with additional information, none is provided with the statistics available online. These supplementary reference documents and similar publications should be readily available for download on the NASS website. Some of these documents could be placed on the "*Understanding Agricultural Estimates*" webpage, but others that directly explain how these data are collected should be available on the website with the reports and the data query page. All of the statistics available in the reports should be made available for download to a spreadsheet.



In some cases, members of the Review Panel felt that NASS's formulas for calculating price indexes were not clearly defined. NASS should define all terms used in calculations and provide brief justifications for their use.

Several additional suggestions to NASS that may improve documentation and transparency follow:

1. Seek public comment before implementing significant revisions;
2. Publicize significant revisions in press releases;
3. Mark statistics that have been revised since last published;
4. Consider providing a single comprehensive documentation report that conforms to NASS's own transparency and quality-of-information guidelines on a regular basis;<sup>8</sup> and
5. Consider providing leadership across USDA agencies to update and re-publish on a regular basis the bulletin, "Major Statistical Series of the U.S. Department of Agriculture."<sup>9</sup>

## RECOMMENDATION 4-2

### **NASS should substantially strengthen its core research capacity.**

NASS has a longstanding reputation as a supplier of dependable, objective and accurate statistics to the Federal government and to the American public. Continued prominence requires that NASS enhance its capacity to conduct and gain access to research that supports its operations programs.

In its deliberations, the Review Panel found several instances where additional research was needed to address problems in data collection, coverage and processing, and index construction. A key research need is to evaluate the tradeoffs between the strengths and weaknesses of NASS and AMS price data for use in NASS price indexes. The Review Panel noted that NASS's research capability—once a source of public and

<sup>8</sup> USDA-NASS. *About NASS: Information Quality Guidelines*. Retrieved January 17, 2009, from [http://www.nass.usda.gov/About\\_NASS/Information\\_Quality\\_Guidelines/index.asp](http://www.nass.usda.gov/About_NASS/Information_Quality_Guidelines/index.asp)

<sup>9</sup> USDA-ERS. *Major Statistical Series of the U.S. Department of Agriculture: How They Are Constructed and Used*. Volume 1: Agricultural Prices, Expenditures, Farm Employment and Wages. ERS Agricultural Handbook No. 671, April 1990.



professional confidence in the Agency's statistics—has been diminished over recent decades.

To the extent feasible, NASS should justify with documented research all substantial decisions about price collection procedures, use of external versus internal survey data and index construction methods. The documentation should include estimates of effects on the accuracy of the statistics produced. Documentation and research are necessary to assure the use of up-to-date statistical methods and consistency across the Agency. It is also important for Agency credibility, in that it allows academics and others outside the Agency to evaluate procedures and revisions.

NASS should consider augmenting its internal research capacity through external contracts and other arrangements that increase access to statistical expertise in academia and elsewhere. This should be in addition to, but not a substitute for, enhancing internal research capacity. Cooperative research agreements would provide opportunity for greater transparency and interaction between a strengthened NASS research capacity and the broader research community. In addition, NASS's staff should be encouraged to publish their research and otherwise maintain their involvement in professional statistical societies. Doing so will enhance the reputation of the Agency and improve its recruiting contacts.

Nearly all of the information NASS provided to the Review Panel was about **operating** the Agricultural Prices Program, not **studying and improving** it. At the outset of their deliberations, the Review Panel requested copies of NASS's research reports about the Agricultural Prices Program. NASS responded with just one report, and it was dated 1983.<sup>10</sup>

The goal for NASS's research should be to improve the efficiency and statistical legitimacy of future operations, as well as the quality and usefulness of statistical products. Part of the research should also involve the design and development of new statistical programs or methods.

Another aspect of research involves monitoring existing operations and searching for ways to improve them. Some examples are traditional survey assessment studies (coverage studies, non-response studies, recordkeeping studies) and meetings of focus groups of data users, conducted on a reoccurring basis. Other possibilities are follow-up surveys with samples of respondents so that NASS can ask them questions about the survey process and its "fit" with how data are available to them and the systems they use or plan to use. Such samples could be partly random and partly judgment samples.

Monitoring existing operations permits a statistical organization to determine if there have been any changes in the survey environment. If there have been changes, then the knowledge gained can be used to guide changes in the organization's survey practices.

Surveys of users by NASS researchers would help ensure the statistics are not becoming less useful over time.

### RECOMMENDATION 4-3

**NASS should accept full responsibility for how it uses, and explains the uses of, data from other agencies for calculating prices and price indexes.**

Other agencies, principally AMS and BLS, are major sources of data used in the calculation of prices received, prices paid and price indexes. For prices received, NASS uses probability surveys to collect price data for selected field crops. The prices for most livestock and livestock products and for most fruits, vegetable and specialty crops come from the AMS price reports. The statistical qualities of those AMS data are either unknown or not transparent. The AMS price data were designed to provide the market with timely price information at major markets. In the index of prices paid, approximately 70 percent (48 percent for the base month of April and 72 percent for other months) of the weight is placed on items that come from BLS, AMS, ERS and DMRkynetec. It was not apparent to the Review Panel that NASS had full access to, and made full use of, information on statistical properties of these external data, the nature and timing of changes and the

<sup>10</sup> House, Carol, et al. June 1983. *Alternative Sampling Frame Construction for the Prices Paid by Farmers Survey: An Overview*. U.S. Department of Agriculture, National Agricultural Statistics Service. AGES830516.

appropriateness of uses being made of the data. Neither is it clear to the Review Panel that the implications of changes in external data are made transparent to the users of NASS price statistics.

In support of this recommendation, the Review Panel offers several specific suggestions:

1. NASS should establish an internal team that works on methodological and other issues related to the use of prices from external sources. Many of the issues related to the quality of external prices are similar to those of the survey-based prices, e.g., breadth of coverage, appropriate specifications of items priced and others. Given the overlap in topics, the team working on external data may need to overlap with staff working on survey data. Users of NASS indexes should know how external prices are processed and used to obtain those indexes. The team working on external prices should be responsible for providing this transparency. This transparency may help NASS staff and data users identify opportunities for improvement.
2. To fulfill its responsibility as USDA's flagship statistical agency, NASS should assume a leadership role in coordinating communications between NASS and other agencies producing and using price data that flow to and from NASS. There could be great benefit from having NASS develop and manage an on-going communication process that facilitates discussion among staff of the various agencies about what each agency can do to improve the overall usefulness of data to all agencies. The communications could focus on such topics as improving transparency and documentation, data improvements that cost little but which improve their usefulness to others, improving compatibility and comparability of data and indexes among agencies and improving notifications about changes in data collection and processes.

NASS's role could be informal or formalized by authority of the Secretary of Agriculture.

Participating agencies should also include those outside USDA that supply or use NASS statistics. Such a formalized communication arrangement would assist with the transfer of

knowledge, expedited notifications and consistency in reporting rather than relying on informal institutional knowledge that can be lost as people retire or leave employment. The information base generated by this coordination will also be useful for improving transparency and documentation. (See *Recommendation 4–1.*)

3. NASS should explore with AMS possible changes in procedures that would facilitate improved measures of the reliability of price estimates that NASS makes based on AMS data. Such changes might include increased sharing of sampling lists and information about sampling methods, response rates and omitted categories. Closer collaboration and consultation between the two agencies might lead to changes in collection methods that would result in more reliable estimates for either or both agencies. Following are examples:
  - a. Additional steps might be taken to assure that the lists of buyers contacted by AMS are as complete as possible. This might involve more efforts to build lists or more sharing of lists between the agencies.
  - b. The methods used by AMS to select buyers to be contacted might be reviewed. In some cases, procedures to change buyer contacts systematically might help to reduce bias. Records of buyers who refuse to participate need to be kept, and procedures should be developed to adjust for such omissions.
  - c. AMS may be able to add marketing locations and quality categories to achieve more nearly complete coverage. Where this is impractical, methods could be developed to adjust for omitted product categories. Ongoing collaboration between NASS and AMS could allow AMS to consider NASS's needs as changes are made and as opportunities arise.

The Review Panel does not wish to imply that NASS can or should tell AMS how to collect data or what data to collect. Rather, it is being recommended that NASS explore the possibilities with AMS. Such exploration seems desirable even if improvements in methods cannot be assured. For those commodities where price reporting is mandatory, accuracy is likely high, in part



because all or nearly all of the population is covered. It would nonetheless be useful to have estimates of accuracy or reliability for both AMS and NASS price estimates for those commodities. Mandatory reporting applies only to some of the livestock and none of the fruits and vegetables. Moreover, there are examples of Federal agencies adding statistical requirements to mandated data collection to fulfill other legitimate needs.<sup>11</sup> Developing new measures of reliability and improving the reliability of NASS estimates based on AMS data will be a difficult task for NASS. AMS cannot be expected to fully meet accepted statistical standards for surveys while reporting daily prices at a relatively detailed level. Yet, it seems possible that ways can be found to attach meaningful measures of reliability to estimates derived from their data.

The point is this: if NASS is going to be successful in revitalizing its prices program, it will be essential to engage AMS in the process. It is the responsibility of NASS to lead that engagement.

#### **RECOMMENDATION 4–4**

**NASS should undertake a comprehensive reexamination of its Agricultural Prices Program to develop a vision for a system of price statistics relevant to the emerging global food and agricultural economy and consistent with broader Federal and international statistical systems.**

In general, the current set of published statistics appears to have been built around a requirement first set in the Agricultural Adjustment Act of 1938 to produce a parity index based to the 1910–1914 time period. The original legislation did not specify what type of index should be formulated, how it should be computed, what items should be included or what sectors of the economy should be included.

NASS should look at its mission in the area of price statistics in the context of the US/Canada/Mexico

statistical system, EUROSTAT and FAO. With the introduction of the North American Industry

Classification System (NAICS) and taking on the responsibility for the U.S. Census of Agriculture, NASS should consider its publication goals broadly within NAICS–Sector 11: Agriculture, Forestry, Fishing and Hunting. For example, NASS should evaluate any content gaps in the PPI. Where appropriate, NASS should work with BLS for it to expand its coverage, produce particular sub-indexes and increase its sample size.

Where NASS-produced indexes are deemed more appropriate, NASS should consider producing price indexes both conceptually and mathematically comparable to the BLS Producer Price Index, making it possible to combine indexes from the two agencies to produce a complete NAICS–Sector 11 index.

Changes in farm production and marketing methods pose challenges to estimating prices received and prices paid. The emergence of new technologies and business practices in production and harvesting changes the mix and variety of inputs purchased and how they are purchased. For example, some survey forms request reporting the prices of animal feed in bags of certain weights, whereas most animal feed today is sold in bulk. This increases the complexity of coverage, weighting and collection of prices paid data. Changes in consumption patterns and the growth in importance of new commodities require a continuous review of the coverage and weights in prices received as well as coverage of new inputs in prices paid.

The fact that NASS has field offices in most states certainly helps keep the Agency abreast of changes in agriculture. However, the demands of day-to-day operations can easily prevent adjusting NASS procedures to take these changes into account. The Review Panel recognizes that NASS is aware of this issue and suggests that the Agency may want to develop explicit processes for periodically assessing sector changes and their implications. The process could involve the use of knowledgeable external industry and academic persons.

<sup>11</sup> As an example, IRS adds questions to business tax returns to facilitate the Census Bureau's use of tax return information to develop its universe frame and for using tax return data in lieu of census reports. Also, the Federal Reserve Board has added questions to its mandatory Call reports to aid the BEA in handling certain financial transactions for the National Accounts. There are numerous other examples involving BEA.



## RECOMMENDATION 4–5

### **NASS should address the issue of potential bias in its price estimates caused by lack of specificity in defining attributes of items for which prices are collected.**

NASS collects data on prices of items that are defined with varying degrees of generality. This opens the possibility of reported price changes coming from a change of attributes of the item or in the conditions of the transaction rather than from a change in the actual level of prices of items with precisely-defined attributes. If, for example, the proportion of high-moisture wheat is higher this year than last, the lower reported price is a function of quality change, not a price change. Of

course, *ceteris paribus*, farm income is lower. But the high-moisture wheat price is not the relevant price for computing a price index. The prices used in the indexes should, theoretically, be based on a set of well-defined items in terms of attributes. This is true for both prices received by farmers for their products and prices paid for input items. Several recommendations in this report relate directly or indirectly to this concern. (See *Recommendations 5–1, 5–3, 6–1 and 7–3.*) The problem is illustrated in NASS’s practice of collecting expenditure and quantity data for calculating prices of broadly-defined commodities, products and input items. In contrast, AMS surveys collect actual reported prices for more narrowly-defined products, though not with probability sampling. (See box: “What is a Price?”)

### **WHAT IS A PRICE?**

The estimation of a price would appear to be a simple task: survey sellers or buyers and ask what they received or paid. In essence, that has been the basis for collecting prices paid and received data in NASS and in its predecessor agencies for more than a century. Statisticians have developed sophisticated probability surveys that produce data to which well-known statistical properties can be ascribed.

But, items being priced have properties which must be considered in collecting price data. Those properties have dimensions that vary, such as item attributes, geographic location, packaging, timing of sales and services associated with the sale or item. The “appropriate” price to be collected depends on the intended use of the data. For example, a probability survey that averages all prices for a given commodity across attributes, locations, times of transactions and embodied services will produce a price that, when multiplied by quantity sold, results in an approximate estimate of gross receipts. But, if the objective is to produce an index of prices received or to contribute to a national index of price changes, it will not be clear whether the reported price changes were actually changes in price levels, attributes, location, services or some mix of these.

Which provides a more accurate estimate of a change in the price level for a given commodity: a probability survey of a very broadly defined product (corn) or a non-probability survey of sellers or buyers in key markets using a consistent, precise item definition (number two yellow corn with specified moisture content)? The question cannot be answered without more information about the details of both types of surveys. The ideal approach, from the standpoint of statistical accuracy, is a probability survey with a precise definition of the item attribute being priced. But, as a practical matter, it cannot be stated with certainty that NASS survey data provide more accurate estimates of changes in price levels than do AMS Market News data. We don’t know whether the NASS data represent price changes or attribute changes. We know the AMS data are more likely to represent changes in price levels, but we don’t know whether the changes represent the population.

This issue is further complicated by the fact that NASS probability survey data and AMS Market News data are mixed in the calculation of price indexes. As an example, NASS average price for “all corn” is mixed with AMS data for the price of Red Delicious apples of a specified grade for selected locations in the construction of a prices received index.

It is not clear to the Review Panel what the resulting index represents.

Development of an improved Agricultural Prices Program for NASS requires sorting out these issues. Doing so will require careful analysis and research to determine the optimum program within given budget constraints and to estimate likely improvements at the margin from additional resources. In this report, the Review Panel urges NASS to identify and prioritize the objectives of the Agricultural Prices Program as part of its new vision for the 21st century. In that process, it will be necessary to address the price definition issues raised in this report.

NASS may have two conflicting objectives in the collection of price data. One is to collect prices that, when multiplied by quantity, give total revenue or expenditures. This helps measure farm income, for example. But, if the objective is to measure price level changes, then prices should be collected for commodities or inputs with specific attributes that are held constant over time, while having a method of dropping outdated items and adding new items, as BLS attempts to do with the CPI. The Review Panel sees this as a critical issue for NASS to address, as it involves both program objectives and accuracy of reported statistics.

The Review Panel offers three additional general recommendations for NASS to consider:

#### **RECOMMENDATION 4–6**

**NASS should consider collecting and processing monthly prices received and prices paid so that they can be published early in the following month.**

Both prices received and prices paid statistics are used for making agricultural projections and for administering farm programs. One of the most important uses of NASS price statistics is for the monthly World Agricultural Supply and Demand Estimates (WASDE) Report prepared by the World Agricultural Outlook Board (WAOB). The WASDE Report is widely used and has a major influence on commodity markets. It is usually released on the 10<sup>th</sup>, 11<sup>th</sup> or 12<sup>th</sup> of each month. Currently, its price predictions rely on the full-month prices from two months earlier and the mid-month prices for the previous month. Obviously, any change in scheduling of reporting prices would require coordination between NASS and WAOB (as well as other users) to assure that a new schedule would work as intended. The Review Panel expressed concern that the mid-month price is subject to point estimate sampling problems and may not be representative of overall price patterns. This change would make full-month estimates from the preceding month available for WASDE and other uses. Mid-month prices for field crops would no longer be collected. Moreover, earlier availability of monthly average prices would be advantageous in the administration of farm programs. For example, Milk

Income Loss Contract (MILC) payments could be made earlier if NASS's monthly average prices for feed were available earlier.



#### **RECOMMENDATION 4–7**

**NASS should seek balance between quality improvement efforts and assuring consistency of price statistics series over time.**

Historical statistics on prices and price indexes are valuable to policymakers, researchers and the general public. They provide a longer-term perspective on economic and market issues of concern to all users.

Continuity in the price statistics series is important to many users who follow price movements over time. Any changes in the methods used to collect data and calculate price statistics should be made as often as necessary to improve statistical quality. However, it is important that these changes be made deliberately and openly. When estimation methods change for a series, reports should provide information for splicing the new estimates onto older series. This may call for recalculating and publishing earlier segments of the series using the new method.

Consistency is required so the data are reliable ongoing indicators of price relationships, including spreads. Any changes in data sources, quality characteristics or characteristics of data obtained from other agencies should be made transparent to users, along with information on how to interpret and value the changes. Much of the data for prices received for livestock is derived from AMS and other sources that may change their sampling and collection procedures over time. Therefore, to the extent that NASS is using these data series, it is recommended that NASS monitor the sampling, collection and reporting of the data sources. Likewise, NASS should communicate this information to the users or at least notify them of these changes with references provided for the appropriate originating administrative units.

As an example, NASS's *Agricultural Prices* reports have a page on "Reliability of Prices Received Estimates." This page references that prices received are based on USDA-AMS reports. It would help users if NASS identified specific reports and even the variables within



the cited reports. Then users would be able to identify at once the current status of prices for those series in between reports.

NASS must continue to seek balance between users' immediate needs and the longer-term goal of improving the quality of the price estimates. It became apparent during the course of the Review Panel's deliberations that maintaining a consistent series to administer existing programs sometimes conflicts with the development of improved price estimates, which might contribute to better policies in the future. This can result from a lack of strong research on what the optimum price series should be. In cases where the statistics are required for administering programs, but viewed as not meeting best practices, NASS should develop a new series to replace the deficient series and then bridge the old and the new series to minimize

disruption to users in the program agencies. (See *Recommendations 4–1 and 4–2.*)

#### **RECOMMENDATION 4–8**

**On its website and in its publications, NASS should treat “agricultural prices” as a major subject and not as a sub-category of “Economics.”**

Identifying “agricultural prices” as a separate category would facilitate user access to information about the prices data (especially online) and would result in NASS combining information now shown under several topics. Also, the resulting higher visibility would be consistent with the Review Panel's view that agricultural prices are important and should be supported with a new vision and clarity of purpose.

### **USDA'S MULTIPLE PRICE REPORTING PROGRAMS**

While this Review focused on the NASS Agricultural Prices Program, it was undertaken in the context of the responsibilities and authorities of USDA and, to some degree, of the Federal government. Basic authorities and resources for NASS programs flow through the Secretary of Agriculture, as do those for all USDA agencies.

NASS is one of several USDA agencies responsible for estimating agricultural prices. NASS has established a number of specific reports and estimating procedures for that purpose. Other USDA agencies with overlapping responsibilities include, but are not limited to: AMS which primarily uses price survey-based estimates from selected buyers; ERS which supports a number of very large surveys of important characteristics of farms and farm families; FSA which develops daily prices for thousands of locations and dozens of commodities nationwide and which relies both on its own price surveys as well as those developed by other agencies and by private firms; and FAS which reports on prices, production and trade globally. The Office of the Secretary and the WAOB use all of these estimates in the preparation of their own official estimates and in their other many economic monitoring responsibilities, as do many other Federal, state and private officials.

The Review Panel deliberated both the extent to which price estimating responsibilities are scattered throughout USDA agencies and the relative effectiveness and qualities of the various ways prices are estimated. The Review Panel recognized that while the price reporting programs of other USDA agencies arose at various times in response to legitimate needs, the result today is a fragmented system that could benefit from a fresh vision that should guide a comprehensive review. Thus, while the programs of other USDA agencies are outside the purview of this Review and beyond the authorities of NASS, the Review Panel felt that NASS—as the flagship statistical agency in USDA and in its advisory role to the Secretary—could provide informal leadership for a comprehensive review of all price reporting and price statistics originating in USDA agencies or used by USDA agencies. Such a review could examine the policy objectives of the various

price statistics, and how the entire USDA program might be improved in terms of rationale, objectives, division of responsibility and accountability, quality of information and service to all legitimate users, including Federal policymakers. The Review Panel encourages NASS to consider how progress might be made on this topic.







## Chapter 5

# Prices Received for Farm Commodities

### BACKGROUND

The collection and publication of statistics on prices received by American farmers for their commodities have a long history, as documented in Chapter 1. As with other price statistics published by NASS, the principal purposes are:

1. to provide a public record that contributes to understanding economic conditions in agriculture,
2. to provide statistics needed to implement programs for which the Congress has provided mandates and authorities,
3. to facilitate analysis of and decisions about policy, and
4. to provide for calculating parity measures.

A more complete summary of the uses of prices received statistics is included in Chapter 2.

NASS reports monthly and annual average prices only; thus, it is not the intent that these statistics would be useful to farmers and farm product marketers in making short-term selling and buying decisions.

However, NASS price statistics and the income and value of farm product sales statistics derived from the prices may be of help in making longer-term investment decisions in farming and farm product marketing. For such purposes, the broadly based state average prices reported by NASS supplement the more specific prices reported by AMS.

The primary users of NASS prices received statistics are those concerned with farmers' incomes and the performance of the farm economy: policymakers,

administrators of farm programs, other USDA agencies, researchers and the public. Federal expenditures for some farm programs related to crops are especially sensitive to NASS's estimates of prices received.

In contrast to estimates of prices received for crops, there are relatively few direct uses of prices received for livestock statistics. Much of the use of prices received for livestock statistics is for research and analysis and for calculation of other measures, such as farm income and parity prices. Some government programs such as the Milk Income Loss Contract (MILC) program and the Wool and Mohair program do make reference to NASS prices received for livestock, but those statistics are usually used for general analysis rather than for implementing specific policies or payments. These uses call for price statistics that are unbiased, reasonably precise and broadly representative of all segments of U.S. agriculture.

### RECOMMENDATION 5-1

**NASS should review, update and improve criteria for choosing between conducting probability surveys and using price data from AMS and other sources especially for those commodities not included in indexes.**

The use of data from probability surveys and from other sources in the same agricultural prices tables and the same price indexes raises questions about the comparability and accuracy of the two data sources. The survey approach used for field crops provides greater assurance of complete coverage and allows measures of precision to be calculated. The use of price data from AMS is less expensive, and the monthly estimates

appear less likely to be affected by monthly and annual changes in the attribute mix within a commodity. Currently, the choice of data collection method is largely determined by commodity characteristics and the resulting marketing practices. However, it is conceivable that some field crops should be switched from surveys to AMS data, if NASS can obtain satisfactory quantity weights for calculating state monthly averages. On the other hand, NASS surveys may be justified for some fruits, vegetables or livestock to obtain higher levels of accuracy or to obtain estimates with probability properties.

NASS should develop procedures for measuring the coverage and accuracy of monthly price estimates based on price data obtained from AMS and other sources. Such procedures should take into account completeness of coverage, bias and precision of estimates, users' needs for accuracy, the value of continuity in series, burdens on respondents and NASS's costs. Bias and imprecision are likely problems. There may be ways to work more closely with AMS to make their price data collection methods a better fit to NASS's needs. Of course, the price data needs of AMS's clientele are much different from the needs of NASS's clientele. AMS's clientele needs daily prices for many different grades and quality specifications. AMS's reporters have time to contact only a limited number of buyers each day and may rely heavily on those buyers who have the broadest grasp of the market. In contrast, NASS prices serve the needs of policymakers and administrators for whom broad coverage and accuracy are especially important. The cost savings achieved by combining the two price data collection efforts for index construction are significant, but added investments should be considered in some cases to provide the accuracy that NASS's clientele needs.

Monthly and yearly changes in the product attribute mix within a commodity may affect the average prices estimated from NASS surveys. For example, the proportion of corn that grades No. 2 may vary between months or wheat protein levels may differ from year to year. An analysis of relationships between NASS's



monthly prices and averages of AMS's prices for specific grades and qualities should help

determine the magnitude of this effect. For example, research could determine the correlation between NASS's monthly price for corn and AMS's average price for No. 2 yellow corn, and how the difference between the two varies over time.

Whenever NASS publishes reports based on data provided by AMS and other organizations, NASS should take the lead in documenting and reporting to users the data sources and the methods used to construct the published estimates. This calls for formalizing relationships with the agencies supplying the price data. (See *Recommendations 4-1, 4-2, 4-3 and 4-5.*)

## RECOMMENDATION 5-2

**NASS should track and evaluate quantitative measures of prices received data collection and processing operations to identify areas for improving the processes and resulting statistics.**

The prices received program publishes monthly estimates and an annual report. It is very common for survey staff, who must meet a monthly publication schedule, to be almost exclusively oriented to the present, not to the past or future. Because of the compressed processing cycle, as soon as the report for one month is released, it is time to start working on the report for the next month. This leaves little time to assess whether current performance is the same or is different from past performance. If it is unrealistic to expect the same staff to handle the assessment, the function of tracking performance may need to be assigned elsewhere, perhaps to the research staff.

The Review Panel recommends that NASS track a specified set of quantitative measures of the prices received data collection and processing operations. The prices received program currently tracks the estimated coefficients of variation (CVs) at the national level. Other quantitative measures that could be tracked include:

1. the proportion of reporters who fail to report in accordance with NASS standards,
2. rates and patterns of item non-response and unit non-response, and
3. edit failure rates for key items.

For each of these, the actual impact on estimates will need to be assessed. Unit non-response, for example, may have a serious effect on some estimates, but not others.

By tracking such measures, it will be easier for the prices received program staff to make comparisons between the present and the past, depending on the extent of changes in the measures over time.

An example of a possible area of process improvement for the prices received survey is a study of question 16 on the Grain, Oilseed and Pulse Profile Questionnaire used by NASS. This question asks the respondent which software or company the firm utilizes to maintain its records. The operation-profile interviewer manual states that “[t]he purpose of this question is to possibly reduce reporting burden in the future. NASS may be able to accommodate firms reporting in the monthly prices received survey if NASS can determine how records are maintained.”<sup>12</sup> A data-collection research methodologist, who is familiar with the literature on effects of recordkeeping practices on response burden, could analyze the responses from the 2008 monthly reports, develop an experiment and then report on the feasibility of using information about a respondent’s recordkeeping software or service company to reduce respondent burden.

NASS should implement a comprehensive survey quality assessment, review and improvement system that addresses both sampling and non-sampling sources of error. Performance measures (e.g., non-coverage, frame error, non-response rates, response error and other measures) should be summarized, along with descriptions of the survey procedures, in regular methodology reports. Periodically (perhaps every few years) a higher level summary and review of changes in these error indicators should be prepared in a Quality Profile. This tracking of error sources will help identify points in the survey process in need of error reduction efforts.

Error reduction may suggest changes in design, training, operations (including technological changes) and management. Such ongoing error tracking, review and corrections should contribute to timely and focused

process changes to improve prices survey data quality.

Research reports and other documentation of ongoing error tracking will also add transparency to NASS operations and product quality. (See *Recommendations 4–1 and 4–2.*)

### RECOMMENDATION 5–3

**NASS should review, update and improve the criteria used to determine commodity, state and attribute coverage.**

Legal requirements to calculate parity prices call for coverage of most U.S. farm products, although there is no requirement for what specific commodities to include. On the other hand, NASS has a specified list of commodities for which prices are used in the administration of several major farm programs. Coverage issues arise most frequently among the commodities not covered by farm programs, particularly the minor fruits and vegetables and specialty crops. Another significant concern is the definition of “commodity” or “commodity group” because of the variation in attributes within products that may have once been considered “generic.”

The development and implementation of new coverage criteria would serve to determine the overall scale of the price statistics program and which commodities and states to include at the margin. Currently, commodities and states to be included for each commodity are determined every three years so that at least 90 percent of aggregate U.S. cash receipts are covered, and each included commodity has 90 percent coverage. The 90 percent criterion is somewhat arbitrary. It should be subjected to sensitivity analysis to determine whether and how large deviations from 90 percent would need to be in order to make a meaningful difference in application. In principle, commodities, states and attributes should be added or dropped at the margin depending on whether benefits to users of the statistics exceed the costs to NASS and respondents for generating the statistics. This cost/benefit comparison is difficult to perform in practice because benefits are especially hard to measure. Measuring benefits involves estimating users’ gains from having more or better

<sup>12</sup> USDA-NASS. 2008 *Prices Received Operation Profile: Interviewer's Manual*. May 2008.

information. The need for consistency in a series is a complicating factor, which implies that changes should not be made without strong evidence that benefits will be increased.

It seems best to start by examining commodities that are on the margin for coverage or for being dropped from coverage. The first step would be to identify the special characteristics of each commodity, such as high production growth rates, movement of production between states, high price variability or proposed government programs. Next, identify the key decisions that would be affected by improved price information, such as decisions about investment in production, processing and marketing facilities and about government programs. Third, develop and apply procedures for quantifying the benefits from improving these decisions through the use of improved price information. This calls for assistance from persons with knowledge of and experience in evaluating information systems. At first, it may be possible to do little more than rank commodities for coverage at the margin. As methods are developed further, the goal would be to develop approximate dollar measures of benefits that would be useful in determining the overall scale of the price reporting program within a cost-benefit framework.





## Chapter 6

# Prices Paid by Farmers

### BACKGROUND

Prices paid by farmers are collected not only for purchased inputs, but also for interest rates, taxes and wages. NASS conducts surveys to obtain prices for many farm inputs, but also relies on other sources for data. Feeder cattle and feeder pig prices are obtained from AMS while ERS provides interest rates and taxes. Custom rates are obtained from a private market service, DMRkynetec, and BLS provides “other services” prices, specifically electric utility prices. Farm supplies and repairs, auto and truck, and building material prices are also provided by BLS. And, of course, BLS provides the CPI. Machinery and tractor, feeds, fuels, fertilizers and chemicals, and seed prices are collected by NASS via survey instruments. NASS also collects wage rate and rent data. In sum, prices paid come from numerous sources and are largely for inputs used to produce traditional, economically important crops and livestock and livestock products.

NASS’s surveys of prices paid are currently conducted annually. Until 2009, NASS surveyed prices for the month of April; now NASS uses March prices. The indexes of prices paid are reported monthly based on BLS data. Price data from AMS are used for some inputs originating in the farm sector (e.g., feeder cattle and feeder pigs), whereas NASS uses its own prices for milk cow replacements and poultry. NASS uses either the BLS CPI or PPI index depending on the particular sub-index (e.g., feed, fuels, etc.) that is being estimated. The monthly indexes are adjusted—benchmarked—to the annual NASS prices each year. NASS reviews the correlation of the BLS adjustment factors with the NASS prices, but problems have occurred. A related

concern is providing transparency about revisions, which can occur because of the annual benchmark adjustments and because BLS data may be revised or corrected. (See *Recommendation 4–3*.)

### Changing Structure and Prices Paid

#### RECOMMENDATION 6–1

**NASS should address the goals and principles for changing the mix of inputs and selecting the attributes of items for which prices are to be collected.**

Profound changes in the agricultural sector are occurring. On average, farms have become larger and more productive, but they are also more specialized but in varied ways. Organic farms are a growing market segment, and their input (and output) prices are likely much different from those for conventional farms. Organic soybean meal used in dairy feed is perhaps twice the price of non-organic meal, but little information exists about the prices of inputs used on organic farms. At the same time, many conventional inputs are not used by organic farmers. There will always be a need for clarity about what is being measured (and not measured) by NASS’s programs.

Large conventional farms often receive discounts from list prices. They may pre-purchase inputs and use forward, futures or options contracts to acquire inputs.

The horticulture sector is another example of increasing diversity. Horticultural products have been a relatively small part of the income of the farm sector, but have been increasing. Grape (wine) production is an example of a growth area; another is ornamentals. Still another



area that we know little about is horse farms. What attention should be given to all of this diversity?

Input suppliers and the items sold change as well. Seed production is increasingly sophisticated and concentrated. The attributes of seeds can change dramatically; seed corn today is much different from the seed corn of just a few years ago. The same can be said for machinery producers and dealers. The quality attributes of tractors and other machinery are changing rapidly.

It is the Review Panel's understanding that NASS is responsive to requests for collecting prices on new inputs, and they have added items to surveys when it is economical to do so. These "new" prices are not necessarily used in the index of prices paid, but accommodate the interests of potential users of their statistics. According to NASS, they collect prices for 35 seeds, but use just eight in the index of prices paid. Likewise, they collect prices on 108 chemicals, but use 19 in the index. At present, NASS collects prices for 297 inputs, 84 of which are used in the index of prices paid.

Decisions about what prices to collect, what prices to use in the index and how to accommodate the changing quality of inputs are a part of the broad issue of how best to represent input prices in an increasingly complex farm sector within the confines of limited resources. Attributes of items for which prices are collected must be carefully defined to reduce bias in estimates of price changes, i.e., to distinguish between price level changes and changes in attributes. Also, without carefully defined attributes, NASS data do not facilitate analysis of the price premium for, say, glyphosate-ready soybean seed or the impact of non-competitive pricing of inputs due to market concentration.

If, as we believe, the most important uses of prices paid relate to economic intelligence about farms (and not to computing parity prices), what prices should be collected? What sectors and types of farms should be covered? More generally, what principles should guide the addition and deletion of items for which price data are collected?



## RECOMMENDATION 6-2

### **NASS should change to semi-annual or more frequent surveys of prices paid.**

Prices for some inputs have become more volatile. Recent examples are the prices of fuels, chemicals and fertilizers, which in turn depend on the prices of petroleum or natural gas. Given the volatility of prices and the diversity of the timing of the purchase of inputs by farmers, a concern is that collecting prices annually is not sufficient to capture the complexity of the prices paid by farmers.

How frequently should prices be collected? March or April prices may be relevant for major crops planted in the spring, but not necessarily for winter wheat or livestock-related inputs. Moreover, it is not clear whether the combination of annual price surveys with BLS-based monthly adjustments can adequately capture the monthly variability in input prices. A second survey period, perhaps August, September or October, would likely reduce the adjustments needed in reported monthly prices paid statistics to bring them in line with survey data.

## Survey Design and Documentation of Methods

### RECOMMENDATION 6-3

### **NASS should develop a research program in prices paid statistics that addresses critical problems in survey design, documentation and identification of appropriate input items to cover. (See Recommendations 4-1 and 4-2.)**

Survey research is concerned not only with imprecision arising from sample selection and estimation, but also due to various non-sampling errors such as coverage, specification, measurement, non-response and with processing errors. The Review Panel suggests a need for further information in each of these areas. The Review Panel specifically agrees with Statistical Policy Directive No. 3: *Compilation, Release and Evaluation of Principal Federal Economic Indicators*,<sup>13</sup> which states that any

<sup>13</sup> Office of Information and Regulatory Affairs, U.S. Office of Management and Budget. *Statistical Policy Directive No. 3: Compilation, Release, and Evaluation of Principal Federal Economic Indicators*. Revised September 25, 1985. Retrieved on March 4, 2009, from [http://www.whitehouse.gov/omb/assets/omb/infoereg/statpolicy/dir\\_3\\_fr\\_09251985.pdf](http://www.whitehouse.gov/omb/assets/omb/infoereg/statpolicy/dir_3_fr_09251985.pdf)



economic indicators program must meet high standards of accuracy and reliability.

The following discussion focuses on prices collected from firms selling inputs to farmers, but, as noted earlier, prices for some inputs are also obtained from other agencies such as AMS. The need to address issues related to price data obtained from other agencies is covered in Recommendation 4–3, but recommendations made herein generally apply to all of the prices paid data, whatever the source.

## Coverage

Conceptually, the universe for prices paid consists of all the purchases of goods and services used for farm production by farmers.<sup>14</sup> To obtain information about the value of the transaction, each transaction must be uniquely associated with an entity capable of reporting the value. Thus, to gain reporting access to such transactions, NASS constructs a sampling frame of retailers and dealers who supply farmers and have knowledge about those sales. However, construction of such a sampling frame, so that it approaches completeness, could be cost and time prohibitive. The sampling frame that NASS uses consists of firms or merchants known to supply the goods or services. Further, the items selected to be surveyed are a subset of the totality of inputs farmers use (and those used in the index of prices paid are a subset of those collected). Thus, NASS reduces the conceptual total universe to a target population of sales from retail outlets or establishments where farmers purchase farm production inputs in 48 of the 50 states. Each state develops a list of selling firms using various sources. From seller lists, a sampling frame is then constructed, and firms to be surveyed are selected into the sample. This current process of frame development creates what is called frame incompleteness; that is, some units in the ideal universe of

transactions would not have any chance of being reported because the firm with knowledge to report is not included in the frame.



The prices paid data are obtained from a survey sample of approximately 8,500 businesses with the firms selected from the state-developed lists by type of item sold. The prices paid series currently consists of almost 300 items that account for approximately 90 percent of farm expenditures for the most commonly used production inputs. Each year, six prices paid surveys are conducted:

1. agricultural chemicals,
2. farm machinery,
3. feed,
4. fertilizer,
5. fuel, and
6. seeds.

The target population is all retail establishments where farmers purchase farm production inputs. As already noted, the firms are selected randomly from lists of sellers by the type of item sold. Firms are asked to report the price of the most commonly purchased item or of the item with the largest volume sold. No adjustments are made for changes in the quality or characteristics of the inputs.

Prior to 1980, the prices paid surveys were non-probability surveys having chronic non-response and coverage issues. NASS—in its widespread list frame development efforts of the 1970s—purchased various business lists and created a list frame that was used for sampling beginning in 1980. Sampling was a cluster sample of counties in each state, followed by a simple random sample of firms within each selected county. Problems remained because the list was believed to be incomplete. It included out-of-scope firms (no farm related sales) and the auxiliary information (e.g., size of firm—information that can be used to make sampling more efficient) was poor or nonexistent. Even today, concerns exist about the auxiliary information because NASS's list updating process uses a screening survey to update “control data.” For previous surveys, non-

<sup>14</sup> For certain commodities or services, such as feeder pigs purchased, sampling frames to gain access to reporters are aimed at farmers who then supply the price data. For example, when farmers in major hog-producing states are surveyed on the number of hogs and pigs on hand, they are also asked about the number, weight and prices of feeder pigs purchased during the previous month. For months having no survey, price estimates for feeder pigs are based on sales reported by AMS and by selected auction markets. Stocker and feeder cattle prices are averages from actual transactions at auctions and through dealers. Sales of cattle weighing less than 800 pounds are used to estimate the U.S. price of stocker and feeder cattle.

respondents to the mail-out screener were not followed up and the non-response rate for this screening operation was not transparent. NASS staff indicated that, pending OMB approval, the next screening survey is planned for 2010, and it is intended that there be follow-up to non-respondents.<sup>15</sup>

In the early 1980s, NASS conducted research on alternative sampling frames for prices paid surveys.<sup>16</sup> The researchers warned that maintenance of the then-current frame would be a burden because establishments change so often that the frame would need to be essentially reconstructed each year to maintain coverage. As an alternative design, the research investigated the possibility of adding questions about where expenditures were recorded for given commodity groups at the end of the Farm Production and Expenditures Survey (FPES) (now ARMS). The researchers made a compelling argument that this method drastically improves coverage (from an average of 50 percent incompleteness).<sup>17</sup> Further, it adjusts to buying patterns as well as providing other desirable properties of probability sampling and provides cost savings. They found that estimates from the then-existing procedures did not compare very well to estimates made from their more technically grounded procedures.

The early research revealed promising options toward improving sampling frames for prices paid through the use of probability surveys. Continued modification, development and testing of these options were recommended. The approach was tried for several years and then discontinued.<sup>18</sup> No further research on the topic is evident.

NASS research should focus on acceptable coverage levels (both overall and by subgroups, e.g., sizes of



farms) relative to the total population of potential respondents, based on statistical

principles related to possible bias and low precision in the estimates. Researchable questions include: What is a satisfactory coverage rate? Are the estimates biased? How should probability surveys be used to help control coverage error?

## Specification

Prices obtained from the surveys of firms should reflect prices for items actually purchased. The quality of price data is dependent upon the reporter's understanding of the price and volume concepts specified by NASS and the ability to quantify and report on those concepts. In this subsection we address two aspects of specification:

1. item comprehension, and
2. item selection.

Regarding item comprehension, merchants are asked to report prices for items meeting certain specifications that were "most commonly bought by farmers" or for the item that was the "volume seller." Items most commonly sold in one community may not be as common in another, and the volume seller in one year or community may not be the volume seller in the next.

General specifications are provided for items being priced, with the aim of comparability in terms of economic use and function. The specifications are intended to prompt the reporter to report prices of comparable items on successive surveys. As an example, a respondent will report the price for a new machinery model that had the same functional use as the one it replaced, even if styling or technology has changed. Still, the guidance provided to respondents generally consists of five or six bullets about the item, each bullet usually having ten or fewer words. These instructions are placed in a simple box near the top of the form. It is not evident that reporters understand the instructions or even recognize the need to review them carefully. There have been considerable recent advances in understanding how form design impacts respondent navigation and understanding of survey forms. Expert assistance in form design for ARMS has demonstrated the potential for improvement of survey forms.

While changes to the input item mix appear to be infrequent, NASS has a mechanism for soliciting comments about needed changes. According to NASS's

<sup>15</sup> Per information from NASS Statistician, Jennifer Sissom, February 27, 2009.

<sup>16</sup> See *Alternative Sampling Frame Construction for the Prices Paid by Farmers Survey—An Overview*, House, C. et al, AGES830516, June 1983.

<sup>17</sup> Researchers estimated incompleteness of the frame in use at the time to be over 70 percent for many commodities. Also, House, Carol, et al. June 1983.

<sup>18</sup> Based on conversation with NASS Deputy Administrator, Carol House, on February 4, 2009.

*Information Collection Supporting Statement (OMB No. 0535–003)*, NASS frequently consults with interested parties within USDA (ERS, FAS, AMS, FSA) and other government agencies (Commerce Department, BLS) and holds regular meetings around the country to obtain feedback. While attendees may focus on the usefulness of the data to them (e.g., current coverage, frequency of release), they may not appreciate the survey methodological issues involved in engineering the data product. Thus, it is reasonable to ask if the feedback methods and questions at the user meetings are appropriate to obtain user input on methodological concerns, and whether attendees have the appropriate knowledge to address such questions. Understanding these issues requires considerable training as well as familiarity with the data. NASS needs a cadre of such expert users (e.g., survey methodologists and economists) of price statistics.

NASS attempts standardization of questionnaires and has a “Questionnaire Repository System,” as briefly mentioned in section 4 of the *2008 Prices Paid Surveys* document.<sup>19</sup> State-to-state comparability<sup>20</sup> is not necessarily ensured by standardized questionnaires,<sup>21</sup> nor is it necessarily best for paper and internet versions of forms to be “kept identical” as implied in section 4 of the *2008 Prices Paid Surveys* document. While NASS has a very knowledgeable and experienced staff involved in conducting the price surveys, a survey methodology program for prices is lacking.

### Sample Selection and Estimation

The current sample design, as distinct from coverage, has the consequence that a small number of reports are obtained for each item in each state (often well under ten reports). Price and volume variability of the item can result in bias problems, especially with the small samples. This sampling strategy is rationalized by statements that the actual price level is secondary to

measuring price changes, and a biased price level can provide good measures of price change for index use. Of course, this is dependent on stability of the “most common” or “volume seller” items. Yet, to have all prices at the proper level would require large increases in sample sizes, and the data collection costs would far exceed current resources. The tradeoffs between cost and the value of sample size increases should be explored.

While the survey methods are somewhat complex (various levels of stratification), the summary procedures for prices are merely a simple average of responses, and they are not designed to provide estimates of sampling variability. NASS’s stated goal is to provide three to five usable reports per survey item per state. The Review Panel did not verify that sampling at this low rate could produce estimates with desirable levels of precision.

### Data Review

NASS has a distributed workload process in which the Field Offices (FOs) are responsible for collecting, reviewing and loading data on the data processing network. FOs perform initial editing. Reports from the states are merged into regional files and processed through a more rigorous consistency check. Data are then summarized to regional and U.S. levels, based on survey indications, by statisticians in the Washington, DC headquarters. Editing software and processing are reasonable, but the small number of reports makes statistical editing methods ineffective. Thus, no way exists to determine the magnitude of sampling and non-sampling errors or to determine if the volume of sales is adequate to obtain reliable prices.

### Measurement Error—Reliability of Data

The Field Offices collect data by mail, telephone, electronic data reporting and personal interview for all prices paid surveys. The Review Panel found no research that assesses whether respondents report prices based on actual transactions or on list prices. That is, how do the respondents “retrieve” the requested information? Do the prices come from records or from memory? Further complicating the retrieval process, little is known about what adjustments

<sup>19</sup> USDA-NASS, *2008 Prices Paid Surveys*, Washington, DC. January 2008.

<sup>20</sup> Standardization does not mean that there are no differences. Questionnaires used for prices paid surveys are regionalized to accommodate varying purchasing patterns across the country while seasonal questionnaires reduce the number of items on a given survey.

<sup>21</sup> We note that some types of standardization can be very important, and states should not have the freedom to implement changes without the appropriate up-front methodological support and going through an appropriate approval process.

are made by reporters for discounts, rebates, loyalty payments, credit, delivery, sales tax and other problems associated with modern transactions and marketing practices. These market practices can vary greatly by type of inputs. For example, rebates and loyalty payments dominate marketing practices for pesticides while they may play an insignificant role for fertilizer. The effects of these practices should be captured in the price data.

## Non-response

Response rates by the voluntary respondents to the prices paid survey in 2008 varied:

- farm machinery, 76%
- retail seeds, 81%
- fertilizer, agricultural chemicals, 81%
- feed, 86%
- fuels, 88%.

At this point, it is unclear what causes these response rates to differ or what direction, magnitude or significance of any bias in the price averages results from this. NASS indicated in their OMB submission that non-response bias analysis has not been conducted for the prices paid surveys. Given the *ad hoc* design of the survey, it would be difficult to assess the impact of non-response bias separately from other sources of error.

## Redesigning the Survey

Given the problem of incompleteness of the sampling frame and the small state sample size, significant quality improvement would require a full redesign starting with the frame. There are a number of technical subjects that require further analysis and call for the development of a methodology program.

## Transparency and Documentation

(See *Recommendation 4–1*.) While the general topics of transparency and documentation are covered in Chapter 4, this section addresses additional concerns specific to prices paid.

Retrieved from its website, NASS's *Information Quality Guidelines* state—



“NASS will make the methods used to produce information as

transparent as possible. NASS internal guidelines call for clear documentation of data and methods used in producing estimates and forecasts such that it can operate a truly national program implemented in 46 State Statistical Offices. Implementation of those guidelines ensures the reproducibility of disseminated information.

NASS estimates and projections are not directly reproducible by the public because all underlying data sets are confidential. However, reproducibility can be evaluated through periodic reviews by outside panels of technical experts and through documentation of methods, assumptions, data sources and related information.”<sup>22</sup>

While internal documentation exists for conducting the prices paid survey, there are few survey design and methodology materials (covering methods, assumptions, data sources and related information) upon which to assess many aspects of the overall quality of prices paid data. If there were prior outside reviews of the prices paid survey, the Review Panel was not made aware of them.

NASS has an online listing of past research, but it is difficult to search. Only one research paper related to prices paid survey methodology (covering aspects such as survey design, sampling error and non-sampling error) could be found.<sup>23</sup>

This lack of readily available information about the surveys hinders any effort to assess adequacy of the prices paid methodology. An example of a detailed web release of technical information for a complex data collection effort is found for the Scientists and Engineers Statistical Data System (SESTAT) surveys.<sup>24</sup> The ERS website for the ARMS surveys is another example of good depth of survey information.<sup>25</sup> Similar information for the prices paid survey program would better address NASS's *Information Quality Guidelines*.

<sup>22</sup> Retrieved January 17, 2009, from [http://www.nass.usda.gov/About\\_NASS/Information\\_Quality\\_Guidelines/index.asp](http://www.nass.usda.gov/About_NASS/Information_Quality_Guidelines/index.asp)

<sup>23</sup> House, Carol, et al. June 1983. *Alternative Sampling Frame Construction for the Prices Paid by Farmers Survey: An Overview*. U.S. Department of Agriculture, National Agricultural Statistics Service. AGES830516.

<sup>24</sup> Retrieved January 17, 2009, from <http://www.nsf.gov/statistics/sestat/technical-info.cfm>

<sup>25</sup> Retrieved January 17, 2009, from <http://www.ers.usda.gov/Briefing/ARMS/>



## Chapter 7

# Price Indexes

### BACKGROUND

The Index of Prices Received (1910) and the Index of Prices Paid (1928) had their origins in attempts to develop simple, aggregate measures of prices received and paid. The indexes were part of the effort in the former USDA-BAE to provide policymakers with measures of the well-being of farmers. A modified Laspeyres Index was adopted as the conceptual basis for the indexes. Over the ensuing years, items (commodities and inputs purchased) were added to both indexes to provide coverage that was more complete. Also, over the years, the weights of items in both indexes were adjusted to reflect changes in commodities produced and inputs purchased. The Agricultural Act of 1949 confirmed 1910–1914 as the original base reference period for all agricultural indexes used for U.S. farm support programs.

The concept of parity evolved from the examination of the relationship between prices received and prices paid to shed light on the economic status of farmers. Parity prices are computed under provisions of the Agricultural Adjustment Act of 1938, as amended by the Agricultural Acts of 1948, 1949, 1954 and 1956. The parity price is the price needed for a unit of a commodity to have an equivalent purchasing power as in the base period (1910–1914).

Parity measures for any agricultural commodity at a given date are determined by a series of legally-defined and somewhat complex calculations. But, in simple terms, the relationship between the index of prices received and the index of prices paid is used to calculate

a parity ratio. The parity ratio provides an indication of the per unit purchasing power of farm commodities generally in terms of goods and services currently bought by farmers in relation to the purchasing power of farm commodities in the 1910–1914 (or later) base period. Thus a parity ratio less than 100 indicates that the average per unit purchasing power of all farm products is lower than in the base period.

An adjusted parity ratio is computed and published quarterly which incorporates payments from Federal farm programs.

The parity ratio was intended as a measure of price relationships. It is no longer a meaningful measure of farm income, farmers' total purchasing power or farmers' welfare. The well-being of farmers depends upon a number of factors other than price relationships, such as changes in production efficiency and technology, quantities of farm products sold and supplementary income, including that from off-farm jobs and Federal programs.

The Review Panel found no examples of parity prices or other parity measures being used currently in the administration of farm commodity programs. However, they are still valued by producer interests for purposes of policy discussion. (See Chapter 1 for an historical perspective of price indexes.)

In addition to being required for the calculation of parity prices, the indexes of prices received and prices paid have many other official and public uses, which are summarized in Chapter 2.



## Recent Changes<sup>26</sup>

Federal regulations require that NASS publish parity prices, the indexes and relevant price data in their monthly publication, *Agricultural Prices*. Until 1994, both the index of prices received and the index of prices paid, which are used to compute parity prices, had not been revised since 1976. The fixed weights used in constructing these indexes became outdated as the mix of commodities farmers produced and the input items they purchased changed. Weights and base and reference periods were updated in 1994, and new procedures were put in place for constructing the price indexes.

Similar changes in the indexes of prices received and prices paid were adopted to maintain consistency in their construction due to their use in the computation of parity prices. The prior fixed-weight indexes were converted to five-year moving average weight indexes. Sources for the weights for the major items are farm expenditure data from USDA's annual Farm Finance Survey (now ARMS), the Farm Costs and Returns Survey and farm cash receipts as published by ERS. They are updated annually. For the more detailed items, the weights are updated less frequently because many of these weights were derived from the 1990–1992 detailed ARMS expenditure data, which are no longer collected because of reduced funding and respondent burden concerns. Three-year moving average weights were considered in order to keep the weights as current as possible, but these proved to be too volatile for the index of prices received since major droughts like those in 1983 and 1988 caused wide swings in the production and in the corresponding prices received and cash receipts for many commodities.

For the index of prices received, monthly adjustments to the weights have also been developed to reflect the

normal marketing patterns of commodities during the year.

Price indexes and parity ratios are now calculated using 1990–1992 as a reference period in addition to the required 1910–1914 reference period. The 1990–1992 indexes are calculated using 1990–1992 as the base period and moving average weights. The 1910–1914 indexes are calculated by linking the 1990–1992 indexes at year 1975 with indexes that use 1910–1914 base prices and quantity weights. Between 1976 and 1996, the base price and weight periods were 1971–1973 and the reference period was 1977. The 1990–1992 period was a time of relatively stable overall prices received and paid. The three-year reference and base period were selected since they provide reference period and base period prices for comparison purposes that are closer overall to historical price trends than a one-year period provides.

The fixed-weight indexes used for the interval from 1910–1914 to 1975 are modified Laspeyres Indexes. A Laspeyres Index is the ratio of a weighted average price for the current period divided by the weighted average price for a base period. It uses expenditure weights from the base period. The indexes that use 1990–1992 as a reference period are calculated as weighted averages of price relatives, where a price relative is the current price divided by the 1990–1992 price. Recent moving average weights are used. The 1990–1992 based indexes differ from the Laspeyres Index and other common index formulas. The effects of these differences on actual results and the degree to which the formulas used meet the standards desired in price indexes are not well known. Taking recently observed expenditures into account is clearly desirable, but the ideal price index generally uses both current and base period weights.<sup>27</sup>

It is still the case that attributes of commodities and inputs priced are not highly specific. This means that the items being priced over time are not strictly comparable. Prices reported reflect not only price levels but also the specific attributes. Hence, price changes

<sup>26</sup> This section draws heavily on: Milton, B., D. Kleweno and H. Vanderberry. *Reweight and Reconstructing USDA's Indexes of Prices Received and Paid by Farmers*. USDA, National Agricultural Statistics Service, Economic Statistics Branch Report No. ESB-95-01. Washington, DC. 1995.

<sup>27</sup> Stone, Richard. *Quantity and Price Indexes in National Accounts*, Organization for Economic Cooperation and Development, Paris, 1956, Section VIII, pp. 106-107.





reported may reflect attribute changes as well as price level changes or both. The Review Panel feels that the current treatment of attribute specificity is likely a source of bias in NASS price reporting.

Crops coverage was expanded in the index of prices received, largely for greenhouse/nursery products, fruits, vegetables and specialty crops. BLS data are being substituted for much of the prices paid data used in the indexes, such as new autos and trucks, building materials and farm supplies. For instance, BLS sub-component indexes like hand tools, power tools and building and construction materials are replacing prices paid survey information for dozens of small input items such as hammers, wrenches, electric saws and rough boards. This use of BLS data with broader item coverage follows the 1976 index revisions that substituted the Consumer Price Index for Urban Consumers (CPI-U) data for the USDA family living surveys that included food, clothing and housing items.

The 1910–1914 indexes of prices received and paid have been updated and revised based upon the changes in the newly constructed 1990–1992 indexes. Linking the prior and revised 1910–1914 index was done at the beginning of 1975, the point in time when the prior weights of 1971–1973 were most current for use in constructing the indexes. From the beginning of 1975 forward, the changes in the 1990–1992 indexes are used to link forward the changes in the revised 1910–1914 indexes.

### Price Program Objectives

Clarification and documentation of program objectives, a common theme of the Review, are also important for price indexes.

## RECOMMENDATION 7–1

### **NASS should have a well-defined conceptual basis for its indexes.**

A new vision for NASS price statistics should include examination and definition of the most appropriate and useful index construct to meaningfully interpret and track changes in the agricultural economy. Change is an ever present factor in statistical measurement, and NASS should consider the conceptual basis for index production most meaningful to today's index uses.

Although it cannot ignore its legislative mandate to produce indexes for parity calculations, NASS should consider the

broader picture and determine what it wants for the future and then determine how best to incorporate its ancillary needs (e.g., parity) into its production system. Consider, for example, the BLS decision to produce a probability-based Consumer Price Index for Urban Consumers in the 1970s. Knowing that the traditional wage-earner CPI was fast losing its relevance to an increasingly service-oriented economy, BLS began producing the CPI-U, while subsuming the production of the Consumer Price Index for Wage Earners (CPI-W) into its computation systems.

Well-defined concepts underlying and justifying price and index measures are useful to developing a strategy for integrating changes in supply and demand into those measures on an ongoing basis. Decisions about concepts of change do not have to be the same for both average prices and indexes, but consistency is helpful. Concern about disruption of ongoing official uses of existing indexes should not become a barrier to researching and testing improved indexes.

### Parity

The Review Panel struggled with the issue of parity. Since parity prices and indexes are not used in the administration of current farm programs and are rarely mentioned in NASS's meetings with its data users, the Review Panel gave little attention to parity calculations or to the appropriateness of alternative parity formulations. NASS reports little response to past changes in the calculation of parity prices. The Review Panel agreed that the parity concept is a wholly inadequate measure of the well-being of farmers and the farm sector. Nevertheless, permanent law continues to require the monthly calculation of the parity index, parity ratio and parity prices.



## RECOMMENDATION 7-2

**A high-level initiative should be undertaken to evaluate official and public interest in the continued calculation and frequency of publication of parity measures.**

A program should be initiated to directly contact users of parity prices and related measures to determine the desired frequency of publication and scope of the parity measures. This question should be discussed at a higher level with appropriate USDA officials and Congressional staff. The responses by users to past changes made in the calculations of parity prices should be reviewed as a guide to how much flexibility NASS has within its legal requirements. The goal should be to minimize constraints imposed by the required parity calculations on improvements in the more heavily used prices received and prices paid measures. Finally, NASS should reduce its dependence on the requirement to calculate parity prices as justification of its Agricultural Prices Program. The recent submission to the Office of Management and Budget for approval of the Agricultural Prices Program indicates that the collection of the price data is covered by U.S. Code Title 7, Section 2204, and is not dependent on the legislation related to the parity prices.

### Index Construction

The following two recommendations address the critically important topic of how indexes are constructed. The topic came up repeatedly during the Review Panel's deliberations because it is seen as central to the quality and statistical integrity of NASS's published indexes.

## RECOMMENDATION 7-3

**NASS should evaluate alternative index formulations and revise the methodology used in construction of its indexes.**

NASS's formula for calculating item indexes follows:

$$I_j = \frac{\sum_{i=1}^n W_{ij} \frac{C_{ij}}{B_{ij}}}{\sum_{i=1}^n W_{ij}} \times 100$$

$I_j$  = Subcomponent Index  
 $i$  = Item  
 $j$  = Subcomponent  
 $C$  = Current  
 $W$  = Weight  
 $B$  = Base

Item weights sum to one (1.0).

Prices received item weights are calculated from the five-year average cash receipts data. The weights for prices received are adjusted monthly based on 1990–1992 average monthly marketings.

Prices paid item weights are generated from NASS/ERS farm expenditure survey data (ARMS).

While the general form of the index used is correct, the problem lies in the particular

prices selected for  $\frac{C_{ij}}{B_{ij}}$ .

From the discussion and materials presented by NASS, these current and base prices are often taken to be average prices for a given month or year. For example, the corn price for a given month is the average of corn prices across the different locations where corn is sold. Average prices are computed as unit values, total value of sales divided by total volume sold or, equivalently, prices at each location averaged across all locations by using current quantity shares of sales. From the perspective of constructing index numbers, what should be used is an index of prices across those locations, not a weighted average of prices across those locations:  $C_{ij}$  in the current period divided by a weighted average of prices across those locations in the base period  $B_{ij}$ .



The following two examples show the potential errors when average prices are used instead of index numbers:

Example 1: Compare the Index of Average Prices,

$$\left[ \left( \sum P_{ci} Q_{ci} / \sum Q_{ci} \right) / \left( \sum P_{bi} Q_{bi} / \sum Q_{bi} \right) \right] \times 100,$$

to the Laspeyres Index,

$$\left[ \left( \sum P_{ci} Q_{bi} / \sum P_{bi} Q_{bi} \right) \right] \times 100,$$

the Paasche Index,

$$\left[ \left( \sum P_{ci} Q_{ci} / \sum P_{bi} Q_{ci} \right) \right] \times 100,$$

and the Fisher's Ideal Index.

$$\left( \left[ \left( \sum P_{ci} Q_{bi} / \sum P_{bi} Q_{bi} \right) \right] \times 100 \cdot \left[ \left( \sum P_{ci} Q_{ci} / \sum P_{bi} Q_{ci} \right) \right] \times 100 \right)^{1/2}$$

The notation  $P_{ci}$  is the current period price at location  $i$ ;

$P_{bi}$  is the base period price at location  $i$ ;

$Q_{ci}$  is the current period quantity at location  $i$ ;

$Q_{bi}$  is the base period quantity at location  $i$ .

The appended note at the end of this chapter includes a spreadsheet that shows two examples:

1. a shift in demand from locations #1 through 4 to location #5 such that total demand is the same, and
2. an increase in overall demand with shift in sales from locations #1 through 4 to location #5.

With respect to Example 1, in equilibrium, prices should not change at each location because they are separated by fixed per unit transfer costs. This example assumes \$0.20 per unit sold difference from the previous location. Location #5 is assumed to be the base location, so it has the highest price. As can be seen, the calculations show that the index of average prices increases approximately three percent while none of the other index numbers changes.

*Thus, in Example 1, the index of average prices erroneously indicates that prices have increased when in fact none of the prices for any of the individual locations has increased!*

The second example indicates that all prices rise, but with still fixed differences due to the fact that arbitrage will eliminate any price differences to the point where prices differ exactly by transfer costs. The total volume sold increases from 1,000 to 1,200 and a higher proportion of sales goes to location #5 than to the other locations. In this case, all four index numbers show an increase in price from the base period. However, the index of average prices overstates the prices index compared to the Laspeyres, Paasche or Fisher Indexes. Indeed, the latter three Indexes all indicate very close changes of approximately nine percent, while the index of average prices indicates a price increase of 11 percent.

These two examples indicate that the index of average prices will overstate price changes. Unfortunately, we cannot say with any confidence what the direction of bias will be. Other examples could be constructed showing that the index of average prices will understate price changes.

While the examples indicate the bias is not all that large, it needs to be stressed that the error indicated here is only for comparison between the current period and the base period. Each time the index is calculated further errors may be present so that, over time, the errors may accumulate and it will be unknown what the magnitude of the errors will be.

It also needs to be stressed that construction of these index numbers at the most elementary level requires no more information than what is being used now. All that is needed are the prices, quantities and expenditures at each location at a point in time. That is what is now used to compute average prices.

Three indexes (Laspeyres, Paasche and Fisher Indexes) have been used, and the examples indicate that all three indexes yield similar results. While evaluating alternative index formulations, NASS should also review research done in BLS and elsewhere to determine the appropriateness of Unit Value Indexes.

The analysis does not indicate that average prices are wrong, only that use of average prices in computation of index numbers is inappropriate. Therefore, use of



average prices when computing such indexes should be minimized to the extent possible.<sup>28</sup>

Price indexes should reflect, as closely as possible, prices for markets cleared in particular time periods. Using moving average quantities can understate or overstate price movements. The usual justification for weights in Laspeyres Index numbers is finding normal time periods. Selecting weights based on the notion that one wants to smooth out fluctuations due to weather, for example, is not justified. It is also unclear how the five-year moving averages are computed, whether NASS uses the current period or lagged periods and which ones? More clarity is needed in definitions and calculations.

Use of five-year moving averages may not be a problem for prices received for livestock, given that asset fixity and specialization within the industry will generally limit the proportional shifts in aggregate quantities. One issue would be the incorporation of state level indexes and simple averages in the parity prices calculation. A unique issue for livestock is that the location and numbers of livestock have shifted dramatically over relatively short periods, and while prices tend to be nationally determined, there can be significant differences between regions.

## **RECOMMENDATION 7–4**

### **NASS should consider improving its data collection to include probability-based surveys for its indexes.**

In order to make an inference about the defined population, probability sampling should be used at all stages. For prices index estimation, an overall measure, such as the CPI for all items, is usually estimated by weighting together sub-indexes for the finest level of detail desired for analytical or publication purposes.

Further, stratified sampling is more efficient than simple random sampling. For these reasons, the universe of interest is usually subdivided into all-encompassing and mutually-exclusive classes or strata that correspond to the sub-indexes of interest. Probability-based mechanisms for selecting among all businesses which might sell any of the items and for selecting specific items to be priced over time within a class should be defined. For each item stratum, the characteristics that are necessary to distinguish among all the items belonging to the stratum are enumerated. The level of detail and extent of the “checklist” should be sufficient to insure that a current price for the exact same item/outlet can be obtained over time.

Sometimes a price for a selected item/outlet becomes temporarily or permanently unavailable. In the first case, some form of item imputation can be used; in the second, a new item should be selected by a probability-based process.

In addition, the long-term problem of reflecting change in the universe of available items/outlets (e.g., the introduction of new technology or entirely new item classes) can be addressed by defining a schedule of sample rotation. For example, one-fifth of the stratum could be resampled each year insuring that no segment of the population is represented by a sample more than five years old.

While switching to all probability-based surveys for index components may be infeasible in the near-term for budgetary reasons, NASS should seek opportunities to move in that direction.

<sup>28</sup> In principle, indexes should be constructed from observations at the lowest level of aggregation where prices and quantities can be matched across years. In some cases this is by geographical location, in some cases by grade, weight class or variety, and, perhaps, in some cases by individual buyer. Some averaging of prices before they are used to construct indexes generally is unavoidable for practical reasons.



## Examples to Support Recommendation 7–3

The following spreadsheet contains two examples which demonstrate the points made in the discussion of Recommendation 7–3. The first example illustrates what happens when there is a shift in the locations of transactions, but the price at each location stays the same.

The second example illustrates what happens when there is a shift in the locations of transactions while prices rise.

**Example 1.** Shift in demand to location #5 from other four locations such that total demand is the same

Location	Price-base	Quantity share-base	Quantity-base	Price-current	Quantity share-current	Quantity-current	pc*qc	pb*qb	pc*qb	pb*qc
1	4	0.1	100	4	0.05	50	200	400	400	200
2	4.2	0.1	100	4.2	0.05	50	210	420	420	210
3	4.4	0.25	250	4.4	0.15	150	660	1100	1100	660
4	4.6	0.25	250	4.6	0.15	150	690	1150	1150	690
5	4.8	0.3	300	4.8	0.6	600	2880	1440	1440	2880
<b>Total</b>		<b>1000</b>	<b>1000</b>		<b>1000</b>	<b>1000</b>	<b>4640</b>	<b>4510</b>	<b>4510</b>	<b>4640</b>
<b>Average</b>							<b>4.64</b>	<b>4.51</b>		

Index of Average Prices 102.8825  $((\sum pc*qc/\sum qc)/(\sum pb*qb/\sum qb))*100$ ; (average price in current period/average price in base period)\*100

Laspeyres Index 100  $((\sum pc*qb/\sum pb*qb)*100)$

Paasche Index 100  $((\sum pc*qc/\sum pb*qc)*100)$

Fisher's Ideal Index 100  $\sqrt{[(\sum pc*qb/\sum pb*qb)*100]*[(\sum pc*qc/\sum pb*qc)*100]}$ ; square root of product of Laspeyres and Paasche indexes.

**Example 2.** Increase in overall demand from 1000 to 1200 and with shift in sales from locations #1-4 to location #5

Location	Price-base	Quantity share-base	Quantity-base	Price-current	Quantity share-current	Quantity-current	pc*qc	pb*qb	pc*qb	pb*qc
1	4	0.1	100	4.4	0.05	60	264	400	440	240
2	4.2	0.1	100	4.6	0.05	60	276	420	460	252
3	4.4	0.25	250	4.8	0.2	240	1152	1100	1200	1056
4	4.6	0.25	250	5	0.2	240	1200	1150	1250	1104
5	4.8	0.3	300	5.2	0.5	600	3120	1440	1560	2880
<b>Total</b>		<b>1000</b>	<b>1000</b>			<b>1200</b>	<b>6012</b>	<b>4510</b>	<b>4910</b>	<b>5532</b>
<b>Average</b>							<b>5.01</b>	<b>4.51</b>		

Index of Average Prices 111.0865  $((\sum pc*qc/\sum qc)/(\sum pb*qb/\sum qb))*100$ ; (average price in current period/average price in base period)\*100

Laspeyres Index 108.8692  $(\sum pc*qb/\sum pb*qb)*100$

Paasche Index 108.6768  $((\sum pc*qc/\sum pb*qc)*100)$

Fisher's Ideal Index 108.7729  $\sqrt{[(\sum pc*qb/\sum pb*qb)*100]*[(\sum pc*qc/\sum pb*qc)*100]}$ ; square root of product of Laspeyres and Paasche indexes.







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## Glossary of Terms

**Administrative data:** Information that is derived from marketings, inspections, acreage contracted and/or certified, assessments, ginnings and other public or private sources that has a direct relation to a commodity and is used to supplement survey data to prepare or revise estimates of average prices in a region in a given time period.

**Average price:** Total value divided by the number of units.

**Base period:** The time interval for which the weights for a price index are calculated.

**Bias:** The difference between the average (mean) value of a statistic over all possible sample outcomes versus the population value of the parameter it is estimating.

**Coverage:** The extent to which the sampling frame includes all the units in the target population and no units not in the population. Missing units can create under-coverage biases while out-of-scope units create sampling inefficiencies.

**Coverage adjustment:** A mathematical procedure that attempts to correct the potential bias resulting from imperfect coverage by the sampling frame.

**Data editing:** Procedures used to attempt to correct sampling data entries deemed in error or to provide data for certain missing entries.

**Enumeration:** A complete count.

**Estimation:** Process by which sample data are used to approximate the value of an unknown quantity (a parameter) of a population.

**Expanded price:** An average price that has been adjusted to account for incompleteness of sample coverage, or to obtain the total value of a commodity.

**Frame:** A list of units or groups of units in a population that can be used for sample selection. Ideally, the list should collectively cover the whole population, and the entries of the list must not overlap, so that every unit of the population belongs to exactly one entry in the frame.

**Index:** A statistical device that serves to indicate a value or quantity of a given statistic at a given time, usually relative to the value of that statistic in a base period = 100.

**Parity:** A concept defined by the U.S. Congress in the Agricultural Adjustment Act (AAA) of 1933, made permanent in the AAA of 1938 and reconfirmed in the Agricultural Act of 1949. The concept was designed to measure the purchasing power of products sold by farmers relative to that in the base period 1910–1914.

**Price index:** A price index (plural: price indices or price indexes) is a weighted average of normalized price relatives for a given group of goods or services, in a given location or region, during a given interval of time. Price indexes are designed to help compare how these prices, taken as a whole, differ between time periods or geographical locations.

Given a basket of goods in time period  $t$ , the total market value of transactions for those goods is  $\sum_{i=1}^n p_{i,t} q_{i,t}$ , where  $p_{i,t}$  is the prevailing price in period  $t$  and  $q_{i,t}$  the quantity sold in time period  $t$ .

Across two time periods,  $t_0$  and  $t_1$ , one might be tempted to calculate the ratio,

$$P = \frac{\sum_{i=1}^n p_{i,t_1} q_{i,t_1}}{\sum_{i=1}^n p_{i,t_0} q_{i,t_0}}$$

to measure the effects of price changes. However, this doesn't distinguish between changes in quantities traded from changes in prices. For example, if all prices are double in period  $t_1$  relative to period  $t_0$  but quantities traded do not change,  $P=2$ . On the other hand, if all quantities are double in period  $t_1$  relative to period  $t_0$  but prices do not change,  $P=2$  as well. Several price indexes have been constructed to address this issue. Four common formulas are the Divisia, Fisher's Ideal, Laspeyres and Paasche Indexes. Definitions of each follow:

**Divisia Price Index:** The *Divisia Price Index* is calculated by the formula,

$$P_D = \prod_{i=1}^n \left( \frac{p_{i,t_1}}{p_{i,t_0}} \right)^{s_i^D}.$$

The Divisia weights usually are defined in terms of the value shares in the initial period,

$$s_i^D = p_{i,t_0} q_{i,t_0} / \sum_{j=1}^n p_{j,t_0} q_{j,t_0}, \quad i = 1, \dots, n,$$

or as the average of the value shares across the two periods,

$$s_i^D = 1/2 \left[ \left( p_{i,t_0} q_{i,t_0} / \sum_{j=1}^n p_{j,t_0} q_{j,t_0} \right) + \left( p_{i,t_1} q_{i,t_1} / \sum_{j=1}^n p_{j,t_1} q_{j,t_1} \right) \right], \quad i = 1, \dots, n.$$

The former weights are the same as in the Laspeyres Index (see definition of Laspeyres Index), while the latter are a midpoint approximation in discrete time to the continuous time definition of the Divisia Index as the total differential of the logarithmic change in value. In both cases, we have  $\sum_{i=1}^n s_i^D = 1$ . Therefore, the

Divisia Price Index is a geometric average of the relative prices, equivalently, the natural logarithm of the Divisia Price Index is the value share weighted average of logarithmic relative prices,

$$\ln P_D = \sum_{i=1}^n s_i^D \ln (p_{i,t_1} / p_{i,t_0}).$$

**Fisher's Ideal Price Index:** *Fisher's Ideal Price Index* is calculated as the geometric mean of the Laspeyres,  $P_L$ , and Paasche,  $P_P$ , Indexes (see definitions of Laspeyres Index and Paasche Index),  $P_F = \sqrt{P_L \cdot P_P}$ .

The inequality  $P_L \geq P_F$  implies that  $P_L \geq P_F \geq P_P$ . This is one motivation for Fisher's Index, since  $P_F$  neither systematically overstates nor understates the impact of prices changes.

**Laspeyres Price Index:** The *Laspeyres Price Index* is computed as

$$\begin{aligned} P_L &= \frac{\sum_{i=1}^n p_{i,t_1} q_{i,t_0}}{\sum_{i=1}^n p_{i,t_0} q_{i,t_0}} \\ &= \sum_{i=1}^n \frac{p_{i,t_1} q_{i,t_0}}{\sum_{j=1}^n p_{j,t_0} q_{j,t_0}} \left( \frac{p_{i,t_1}}{p_{i,t_0}} \right) \\ &= \sum_{i=1}^n s_i^L \left( \frac{p_{i,t_1}}{p_{i,t_0}} \right), \end{aligned}$$

where  $s_i^L = p_{i,t_0} q_{i,t_0} / \sum_{j=1}^n p_{j,t_0} q_{j,t_0}$ ,  $i = 1, \dots, n$ ,

is the expenditure or value share of the  $i^{\text{th}}$  good in the original time period,  $t_0$ , and  $\sum_{i=1}^n s_i^L = 1$ . Thus, the Laspeyres Price Index is a weighted average of price relatives using the initial period's value shares as weights.

A Laspeyres Index of 1 states that an agent in period  $t_1$  can afford to purchase the same bundle that was purchased in period  $t_0$  given that total expenditure does not change. Due to substitution among goods at different prices,

$$\begin{aligned} \sum_{i=1}^n p_{i,t_1} q_{i,t_0} &\geq \min_{\{q_{i,t_1} \geq 0\}_{i=1}^n} \left\{ \sum_{i=1}^n p_{i,t_1} q_{i,t_1} : \right. \\ &\quad \left. u(q_{1,t_1}, \dots, q_{n,t_1}) \geq u(q_{1,t_0}, \dots, q_{n,t_0}) \right\}, \end{aligned}$$



where we take the previous period's bundle,  $(q_{1,t_0}, \dots, q_{n,t_0})$  as given and  $u(q_{1,t_1}, \dots, q_{n,t_1})$  is the utility function if the agent is a consumer and the production function if the agent is a producer. This implies that the Laspeyres Index systematically overstates the effect of price changes.

**Paasche Price Index:** The *Paasche Price Index* is computed as

$$\begin{aligned} P_P &= \frac{\sum_{i=1}^n p_{i,t_1} q_{i,t_1}}{\sum_{i=1}^n p_{i,t_0} q_{i,t_1}} \\ &= \sum_{i=1}^n \left( \frac{p_{i,t_1} q_{i,t_1}}{\sum_{j=1}^n p_{j,t_0} q_{j,t_1}} \right) \left( \frac{p_{i,t_1}}{p_{i,t_0}} \right) \\ &= \sum_{i=1}^n s_i^P \left( \frac{p_{i,t_1}}{p_{i,t_0}} \right), \end{aligned}$$

where  $s_i^P = p_{i,t_0} q_{i,t_1} / \sum_{j=1}^n p_{j,t_0} q_{j,t_1}$ ,  $i = 1, \dots, n$ ,

is the pseudo-expenditure or pseudo-value share of the  $i^{\text{th}}$  good for period  $t_0$  prices and period  $t_1$  quantities, and  $\sum_{i=1}^n s_i^P = 1$ . Thus, the Paasche Price Index is a pseudo-value share weighted average of price relatives using the final period's quantities times the initial period's prices to calculate the pseudo-value shares as weights.

Due to substitution among goods at different prices,

$$\sum_{i=1}^n p_{i,t_0} q_{i,t_1} \geq \min_{\{q_{i,t_0}\}_{i=1}^n} \left\{ \sum_{i=1}^n p_{i,t_0} q_{i,t_1} : u(q_{1,t_0}, \dots, q_{n,t_0}) \geq u(q_{1,t_1}, \dots, q_{n,t_1}) \right\},$$

where the final period's bundle of quantities,  $(q_{1,t_1}, \dots, q_{n,t_1})$ , are taken as fixed. The left-hand side is the denominator in the Paasche Price Index, so the Paasche Price Index systematically understates the effect of price changes, and  $P_L \geq P_P$  for any change in price between  $t_0$  and  $t_1$ .

**Reference period:** The time interval used to calculate the index numbers used for a price series. For example, the parity index uses a 1910–1914 reference period. The indexes for those periods are equal to 100.

**Probability survey:** A survey in which every element in the population has a known and non-zero probability of being selected for the sample.

**Sample:** A subset of the population selected as the group from which data will be collected.

**Section 32 Funds:** A provision of Public Law 74–320 (1935) which earmarks an appropriation the equivalent of 30 percent of annual custom receipts to USDA to support the farm sector in a variety of ways.

**Survey:** A set of procedures designed to obtain data from some or all members of a population.

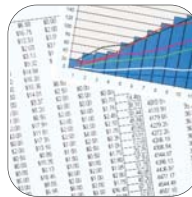
**Total survey error:** A mathematical description of the average (mean) of the squared difference between a statistic and the parameter it is estimating. This will include components of variability and biases arising from various non-sampling errors, such as under-coverage, imputation and non-response.

**Under-coverage:** Failure to include all units belonging to the target population in a sampling frame.

**Weight:** Multiplicative factors that are used to combine price data on individual commodities to construct an aggregate index. The weights reflect the proportion of total expenditures associated with the individual commodities in an index, which sum to 1.0.









## Acronyms

**AAA:** Agricultural Adjustment Acts of 1933 and 1938.

**AAEA:** Agricultural and Applied Economics Association (formerly American Agricultural Economics Association).

**ACRE:** Average Crop Revenue Election, an optional income support program for farmers authorized by the Food, Conservation and Energy Act of 2008.

**ARH:** Actual Revenue History, a pilot program of USDA's Risk Management Agency.

**AMS:** Agricultural Marketing Service, an agency of the U.S. Department of Agriculture.

**ARMS:** the Agriculture and Resources Management Survey conducted by NASS for ERS.

**BAE:** Bureau of Agricultural Economics, an agency of the U.S. Department of Agriculture that is the predecessor agency to NASS and ERS.

**BEA:** Bureau of Economic Analysis, U.S. Department of Commerce.

**BLM:** Bureau of Land Management, U.S. Department of Interior.

**BLS:** Bureau of Labor Statistics, U.S. Department of Labor.

**CBO:** Congressional Budget Office.

**CCC:** the Commodity Credit Corporation, an agency of the U.S. Department of Agriculture that provides funds for farm support programs.

**C-FARE:** The Council on Food, Agricultural & Resource Economics.

**COA:** Census of Agriculture. Conducted every five years, the COA is a widely used source of data describing the nation's production agriculture sector.

**CPI:** Consumer Price Index, published by the Bureau of Labor Statistics.

**CPI-U:** Consumer Price Index for Urban Consumers.

**CPI-W:** Consumer Price Index for Wage Earners.

**ERS:** Economic Research Service, an agency of the U.S. Department of Agriculture.

**EUROSTAT:** the statistical agency of the European Commission. EUROSTAT maintains comprehensive statistics on the European Union and its member states.

**FAO:** Food and Agriculture Organization of the United Nations.

**FAS:** Foreign Agriculture Service, an agency of the U.S. Department of Agriculture.

**FSA:** Farm Service Agency, an agency of the U.S. Department of Agriculture that services farmers with offices in most counties.

**GDP:** Gross Domestic Product, a measure of the total value added by the domestic production of goods and services.

**GNP:** Gross National Product, a measure of the total value added from all sources.

**IPA:** Interagency Personnel Agreement.

**MILC:** Milk Income Loss Contract, a Federal price support program for milk.

**MYA:** Marketing Year Average price.

**NAICS:** North American Industry Classification System.

**NASS:** National Agricultural Statistics Service, an agency of the U.S. Department of Agriculture responsible for a wide array of agricultural surveys and statistics.

**NMY:** National Marketing Year or season-average commodity prices received for specified crops.

**OMB:** Office of Management and Budget, Executive Office of the President.

**PCCP:** Price Counter-Cyclical Program, a provision of the Food, Conservation and Energy Act of 2008 that provides payments to producers under specified market conditions.

**PCE:** Personal Consumption Expenditures, a measure of aggregate consumer expenditures, published by the Bureau of Economic Analysis, U.S. Department of Commerce.

**PPI:** The Producer Price Index program measures the average change over time in the selling prices received by domestic producers for their output. The prices included in the PPI are from the first commercial transaction for many products and some services.

**RMA:** Risk Management Agency, an agency of the U.S. Department of Agriculture.

**SESTAT:** Scientists and Engineers Statistical Data Systems.

**SURE:** The Supplemental Revenue Assistance program of the Food, Conservation and Energy Act of 2008.

**USDA:** United States Department of Agriculture.

**WAOB:** World Agricultural Outlook Board, an agency of the U.S. Department of Agriculture that coordinates agricultural commodity supply and utilization estimates, published in WASDE.

**WASDE:** World Agricultural Supply and Demand Estimates, a monthly USDA report, published by WAOB, that contains global agricultural commodity supply and utilization estimates.





## Appendix A

# Review Procedures and Methods

The procedures for this Review were designed to assure objectivity, independence, freedom from conflict of interest and the highest possible level of professional competence. In general, the procedures were similar to those used by the National Academies of Sciences (NAS).

During the winter and spring of 2008, NASS officials met with the C-FARE Board of Directors to frame the content and objectives of the proposed Review. They agreed on a statement of task, scope of review and a budget. The two parties signed a contract on June 11, 2008. After that, C-FARE began the process of assembling a Review Committee and a Review Panel of experts. The strength of C-FARE, relative to the Review, is its familiarity with, and access to, social-science expertise in academia, government and the private sector. Utilizing that strength, the board selected a Chair and Vice-Chair of the Review Committee. The Chair, working with the C-FARE Board, selected a Review Director. The Review Director and Chair then selected 16 experts for the Review Panel based on two criteria: an appropriate range of expertise and a balance of perspectives.

The exact range and mix of expertise required on the Review Panel flowed from the major issue areas NASS identified for review. Each member of the Review Panel was chosen for his or her ability to address one or more of these major issue areas. The resulting mix represented a variety of statistical and economics specialties. Members of the Review Panel were also selected to provide a balance of experience and perspectives. Since the question of how price data are

used and by whom was cited by NASS as an important question, several members, having the prerequisite expertise, were selected with that experience, interest and perspective in mind. Thus, the Review Panel reflected academic, government and business interests. In the end, the Review Panel represented a high level of expertise and a balance of disciplinary, gender, ethnic and user experience and interest. Once selected, each member served as an individual expert and not as a representative of any group, organization or interest. Prior to confirmation, each potential member of the Review Panel was screened for conflicts of interest. Each candidate was verified by NASS as having no contractual, advisory or financial links (past or present) to NASS that would constitute a conflict of interest. USDA employees were ineligible to serve on the Review Panel. Once the entire Review Panel was assembled, the full list of members was checked a final time by the C-FARE Executive Committee and NASS for conflicts of interest.

Prior to the beginning of deliberations of the Review Panel, the Review Director and Chair gave the charge to the Review Panel, laying out individual and group responsibilities and expectations. They also provided a timeline with major benchmarks to assure completion of a satisfactory review by the July 1, 2009 deadline. NASS provided pertinent background materials pertaining to the Agricultural Prices Program and the issues under review. Finally, C-FARE publicized the Review and invited input from users of price data and other stakeholders. (See Appendix B.) The Review Panel began deliberations in Washington, DC, on

October 15–17, 2008. The first day was devoted to presentations by NASS staff followed by questions from the Review Panel. On the second and third days, several hours were devoted to input from USDA-ERS, a major user of price data, and from a panel of USDA and Congressional policy experts, who explained how they used price data and spoke of issues pertaining to those data. All these information-gathering sessions were open to the public.

To focus more intently on specific issues, the Review Panel divided itself into sub-panels with a chair for each. Provision was made for addressing issues that did not fit neatly into the boundaries of any single sub-panel. By the end of the first meeting of the Review Panel, the sub-panels had made a first cut at defining problems and issues around which they would deliberate and, possibly, make recommendations. Between the formal Review Panel meetings, sub-panel chairs and members worked both independently and as teams via conference calls and email. All draft materials from all sub-panels were shared by email with other sub-panel chairs, the Review Director and Review Committee Chair. One purpose of sharing was to identify overlaps and gaps in issues coverage. Another was to identify issues of common interest. Sub-panel members also held occasional conference calls.

To assure full access to information needed by the Review Panel, NASS assigned a liaison, who responded quickly and completely to requests. NASS was not provided access to draft materials arising out of sub-panel deliberations. However, the NASS liaison was asked to review the preliminary and final manuscripts for any errors of fact. Prior to the second meeting of the Review Panel in Washington, DC, in February 2009, drafts of key parts of the final report were circulated to all members of the Review Panel. These included drafts of deliberations and recommendations by the sub-panels. At this second meeting, the Review Panel scrutinized, debated and refined these drafts. Shortly after the February meeting, sub-panel chairs forwarded rewritten drafts of their reports to the Review Director.

During March, the Review Director merged the sub-panels' drafts into a complete and internally consistent report. Several themes common to the overall Review were identified. Recommendations related to those common themes and other general recommendations were consolidated into a separate chapter of the report to eliminate duplication. The resulting comprehensive manuscript was edited. The resulting edited draft was reviewed again by the Review Panel. It was sent to four external reviewers at the end of March 2009. At a final meeting of the Review Panel on April 23, 2009, the Review Panel considered external reviewer comments and any final concerns about the report. The Review Director reminded the members of the Review Panel of their right to file a minority report on any topic where agreement could not be reached. The Review Panel reached consensus on all major issues, and there were no minority reports.

When all external and internal comments were addressed, a layout specialist completed preparation of the manuscript in June. On May 14, 2009, NASS officials were briefed on highlights of the forthcoming report. As required by the contract, a camera-ready manuscript was provided to NASS prior to July 1, 2009. NASS will publish the report without comment and release it to the public.







## Appendix B

# Stakeholder Input to the Review

As part of its assessment of the NASS Agricultural Prices Program, the Review Panel solicited input from representatives within the public, private and academic communities. Efforts to contact price statistics stakeholders for public comment included email campaigns and individual phone calls to agricultural economists and other professionals in the agricultural community. Forums for public comment were held at the 2008 Annual Meeting of the Agricultural and Applied Economics Association (AAEA) (formerly the American Agricultural Economics Association) in Orlando, Florida, and the first meeting of the Review Panel on October 16, 2008, in Washington, DC. Those who could not attend one of the open forums were invited to submit written statements.

Those who commented included representatives of farm and commodity organizations, government officials, policy analysts, commodity market analysts and university researchers. Their data interests varied, but all wanted continuation of prices received and prices paid and the indexes for both. Interest in parity prices and the parity index was mixed, with most support coming from commodity organizations. Most interest centered on coverage issues (commodities and prices paid items), accuracy of data and a clear understanding of what the data represent. Interest was also expressed in improved timeliness of data availability. Some specific expressions of interest and concern included:

- Concerns about how contracting and vertical integration in the food chain affect accuracy and weights of “farm-level” price data.
- Questions about what a “farm-level price” really means given rapid changes in the structure of agriculture and the food chain and the growing dominance of large farms and large buyers.
- The need to update and expand the list of fruits and vegetables included in prices received. Some new Federal risk management programs, especially pilot revenue insurance programs, may require prices received data on more specialty and minor crops.
- Questions about the costs and usefulness of calculating parity prices and indexes. However, commodity organizations strongly support the calculation and publication of parity prices.
- Strong interest on the part of government analysts and policy officials in maintaining and improving prices received and prices paid statistics for a host of official uses. (See Chapter 2.)
- Strong support for price data on the part of USDA and Congressional analysts for policy analysis and analyses of commodity markets.
- Interest on the part of one commodity organization for more state-level reporting of monthly prices of various types of a particular grain.
- The importance, as seen by commodity organizations, of continuing to report monthly prices paid and prices paid indexes for the current list of categories and sub-categories of inputs, because of increased instability in input markets.

**Verbal presentations were made by the following stakeholders:**

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**William McBride,**  
Senior Agricultural Economist,  
for Katherine Smith  
(Administrator, USDA-ERS)

**Larry Salathe,**  
Senior Analyst,  
Office of the Chief Economist,  
USDA

**Craig Jagger,**  
Chief Economist,  
Agricultural Committee,  
U.S. House of Representatives

**Joy Harwood,**  
Director,  
Economic Analysis Division,  
USDA-FSA

**Written comments were received from the following stakeholder organizations:**

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**USDA-Economic Research Service**

**USDA-Risk Management Agency**

**U.S. Department of Commerce, Bureau of Economic Analysis**

**USA Rice Federation**

**Participants in the forum on the Review of the USDA-NASS Agricultural Prices Program at the AAEE Annual Meeting held in Orlando, Florida, July 2008:**

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***Academic Community***

**John Brandt,**  
North Carolina State University

**Jerry Fletcher,**  
West Virginia University

**Gail Cramer,**  
Louisiana State University

**Steve Turner,**  
Mississippi State University

**John Nichols,**  
Texas A&M University

**Ron Plain,**  
University of Missouri

**Timothy Eagan,**  
Iowa State University

***Government Agency Community***

**Kevin Barnes,**  
USDA-NASS

**Lars Brink,**  
Agri-Food Canada

**Mark Denbaly,**  
USDA-ERS

**Carrie Litkowski,**  
USDC-Bureau of Economic Analysis

**Michael Steiner,**  
USDA-ERS

***Farm Organization Community***

**Bob Young,**  
American Farm Bureau Federation





## Appendix C

# Biographies of the Review Panel

**Corinne Alexander** is Assistant Professor of Agricultural Economics at Purdue University. She serves as an Extension Specialist in the area of grain marketing. Her goal is to assist farmers and agricultural businesses with the marketing of their grain both in commodity markets and in specialty markets. Dr. Alexander received her Ph.D. in Agricultural Economics from University of California, Davis, with fields in agricultural economics and resource economics. Her research generally focuses on interactions between members of the supply chain, with a particular interest in contractual relationships. Her current research examines how farmers' production decisions interact with their marketing decisions. In two specific projects, she is evaluating the costs and benefits of an on-farm quality assurance program developed at Purdue, and examining how European regulations preventing the import of non-approved transgenic crops have affected Indiana farmers' decisions to adopt Bt corn resistant to corn rootworm.

**Walter J. Armbruster** is President Emeritus of Farm Foundation. Throughout his early career in USDA and his 30-year tenure with Farm Foundation, he has relied on NASS prices and other statistics to develop an understanding of the economic and policy issues that academic, industry and government participants must address to maintain a competitive U.S. agricultural and food production and marketing system. He has served as President of the American Agricultural Economics Association, the International Food and Agribusiness Management Association, and the American Agricultural Law Association. He has served on numerous research,

education and policy advisory committees and is currently a member of the National Agricultural Research, Extension, Education and Economics Advisory Board. Dr. Armbruster is a Fellow of the American Agricultural Economics Association, the American Association for the Advancement of Science and the International Food and Agribusiness Management Association and is a Distinguished Agricultural Alumnus, Purdue University. He received his B.S. and M.S. degrees from Purdue University and his Ph.D. in Agricultural Economics from Oregon State University.

**Johnny Blair** has served as Principal Scientist and Survey Methodologist at Abt Associates, Inc., since 2001. Previously he spent 30 years in academic survey research centers, including serving as the Acting Director of the Survey Research Center at the University of Maryland at College Park and the Manager of Survey Operations for the Survey Research Laboratory at the University of Illinois at Urbana-Champaign. Mr. Blair has conducted research in a number of areas, including sampling for rare populations, within-household respondent selection methods for random-digit dialing surveys, measurement error in proxy reporting, data quality in converted-refusal interviews, and the design and analysis of cognitive interviews for pre-testing.

**Arlin Brannstrom** is a financial expert, professional educator and researcher specializing in farm financial management, accounting and farm business planning and analysis. He has extensive experience in teaching and conducting workshops for professionals in agricultural management and finance. Mr. Brannstrom has been the

Academic Vice President for the American Society of Farm Managers and Rural Appraisers since 2006. In 1972, Mr. Brannstrom received a B.S. with Honors in Agricultural Economics; in 1973, he received an M.S. in Agricultural Economics and in 1991 an MBA in Finance all from the University of Wisconsin-Madison.

**Brian Buhr** is Head of the Applied Economics Department and also serves as the E. Fred Koller Chair in Management Information Systems at the University of Minnesota. Professor Buhr works in the areas of commodity marketing with an emphasis in livestock markets. He has worked extensively with commodity marketing groups on risk management, value added marketing and the economic impacts of policy and technology. Current research includes analysis of the economic value of traceability in agribusiness and the incentive mechanisms that can improve product quality and conduct of market participants. Professor Buhr is also conducting policy research on issues of animal welfare, the impacts of biofuels on the livestock and meat industry and the economic impacts of animal diseases in livestock. Recent publications have appeared in the *American Journal of Agricultural Economics*, *Journal of Agricultural and Resource Economics*, *Agricultural Finance*, *Review of Agricultural Economics* and the *Journal of Food Distribution Research*. Dr. Buhr received his Ph.D. from Iowa State University.

**Ismael Flores Cervantes** is a statistician at Westat with 16 years of experience in sample design and selection, variance estimation and data analysis. He has worked on several, large random digit dialing (RDD) surveys, such as the National Survey of America's Families. He has been the lead statistician of the California Health Interview Surveys since 2003. His topics of interest are weighting as sampling of rare populations. He has also published on weighting adjustments for non-telephone households in RDD surveys, and he was a contributor to the *Advances in Telephone Survey Methodology* (Wiley Series in Survey Methodology). He was a consultant for the World Bank on survey design issues and currently is a consultant to the Mexico Department of Education in Mexico City on



the sample selection and weighting of education surveys. He has conducted workshops in

Variance Estimation, Sampling and Weighting in Colombia and Mexico. He was an American Statistical Association associate fellow at USDA-NASS from 1991–1992. He received his M.S. in Statistics from the University of Texas at Austin, 1991, and a B.A. in Electrical Engineering from the Universidad de las Americas in 1989.

**Gail L. Cramer** is currently Professor and Head of the Department of Agricultural Economics and Agribusiness at Louisiana State University. He was the L.C. Carter Chair Professor in the Department of Agricultural Economics and Agribusiness at the University of Arkansas from 1987 to 2000. He attained his Bachelor's degree in 1963 from Washington State University, his master's degree from Michigan State University in 1964, and his Ph.D. in Agricultural Economics from Oregon State University in 1967. From 1967 to 1987, Gail Cramer was Assistant Professor, Associate Professor and Professor in the Department of Agricultural Economics and Economics at Montana State University. He has received numerous teaching and research awards, both domestic and international. He is especially noted for his research in wheat and rice marketing. He has published more than 200 journal articles and other publications in the general area of grain marketing. His rice research has taken him throughout the world, and he has presented seminars on his research in more than a dozen countries. He received the International Award from Gamma Sigma Delta in 2003 and was selected a Fellow of the International Agribusiness Management Association, IAMA, in June of 2003. In addition, he was selected for the Lifetime Achievement Award by the Southern Agricultural Economics Association, SAEA, in 2002.

**Cathryn S. Dippo** retired as associate commissioner of the Office of Survey Methods Research at BLS, U.S. Department of Labor. While at BLS, she chaired the FedStats R&D Working Group and the Current Population Survey Redesign. She started the National Science Foundation/American Statistical Association/BLS Senior Research Fellow Program in the mid-1980s and the BLS Behavioral Science Research Center in the late 1980s. An office holder and member of several statistical societies, she has published a number of articles and has served as a referee for various statistical

journals. She was a member of the Committee on Social Security Representative Payees, National Research Council, which prepared the following book for publication in 2007: *Improving the Social Security Representative Payee Program: Serving Beneficiaries and Minimizing Misuse*, and other National Academies committees. She received a Ph.D. in Mathematical Statistics from George Washington University.

**Ronald S. Fecso**, Chief Statistician, U.S. Government Accountability Office. His role at GAO is to support and extend the work of GAO teams and contribute to the overall quality of the information GAO supplies to Congress. Ron came to GAO from the National Science Foundation (NSF) where he served as Chief Statistician from 1998 to 2006. At NSF, he was responsible for the technical supervision of and confidentiality issues related to the survey and statistical activities of NSF's Division of Science Resources Statistics. He has contributed to the development of OMB directives and guidelines while serving on the Federal Committee on Statistical Methodology and the Confidentiality and Data Access Committee. Formerly, he was a Senior Research Statistician for NASS and a Study Director for the National Research Council's Committee on National Statistics (CNSTAT). He was elected fellow of the American Statistical Association, served on ASA's Board of Directors for the 2006–2008 term, and is a past-president of the Washington Statistical Society. He has taught sampling at USDA's Graduate School and at George Mason University. His degrees are in Mathematics from Rider and Mathematical Statistics from the University of Rochester.

**Richard (Dick) Heifner** is a retired agricultural economist who has devoted his career to evaluating government agricultural programs and farmers' marketing strategies. His work is represented by numerous journal articles, bulletins, and administrative reports produced over some 40 years. As a graduate student at Iowa State University, he examined effects of price support programs and soil bank programs. As an assistant/associate professor at Michigan State University, he concentrated on farmers' marketing problems, including grain storage strategies, processing plant location, and the potential for electronic marketing. During his 29-year tenure at USDA, mostly

at ERS, Dick helped to evaluate the potential for farmers to use futures markets, futures regulatory programs, dairy programs, grade standards for fresh produce, proposals to support farmers use of agricultural options contracts, crop insurance programs, and other Department programs. He was among the first to show how futures hedging can be optimized using the tools of stock portfolio analysis. As senior staff economist at AMS, he led a major study on fruit and vegetable marketing orders. Dick grew up on a farm in Iowa. He holds a B.S. in Agricultural Education (1956) and a Ph.D. in Agricultural Economics (1963), both earned at Iowa State University. He served six years in the U.S. Army on active duty and in the reserve. He was a director of the American Agricultural Economics Association in 1979–1982 and received USDA awards for superior service in 1975 and 1985.

**Jeffrey T. LaFrance** is a professor in the School of Economic Sciences at Washington State University. He also has been a faculty member at Montana State University, the University of Washington, the University of Arizona, and the University of California, Berkeley. His research interests are broad, including agricultural policy, microeconomic theory, the economics of consumer behavior and nutrition, the economics of natural resource use and the environment, dynamic economic systems, and econometrics. Honors and awards include Outstanding Ph.D. Dissertation, Quality of Research Discovery, Outstanding Master's Thesis, Best Journal Article and Distinguished Fellow from the AAEA; Outstanding Master's Thesis, Outstanding Published Research, Outstanding Professional Service and Distinguished Scholar from the WAEA; and a Senior Fulbright Research Scholarship from the U.S. Council on International Education. He has received grants from the USDA, EPA, DOD, NSF, the States of Arizona, California, Montana and Washington and other agencies. He has a Bachelor of Science in Economics (1977) and Master of Science in Applied Economics (1979) from Montana State University in Bozeman and a Ph.D. in Agricultural and Resource Economics (1983) from the University of California, Berkeley.





**John E. Lee Jr.** is retired Professor and Head, Department of Agricultural Economics, Mississippi State University. Previously, he spent 32 years at USDA-ERS in Washington, DC, the last 13 of which he was Administrator of the Agency. His fields of interest and writing are agricultural policy, credit and evolution of the domestic and global food system. He has authored more than one hundred professional publications, papers and presentations. He continues to be professionally active with consultation and contract work. John Lee received his undergraduate and M.S. degrees from Auburn University and his Ph.D. in Economics from Harvard University. He is a Fellow of the American Agricultural Economics Association, past President of the AAEA Foundation and recipient of the SAEA Lifetime Achievement Award.

**William Motes** is the Chief Economist of Informa Economics, Inc., where his primary responsibilities include client consulting, economic policy studies, international commercial client consulting and international development projects. Formerly, he was a principal member of Economic Perspectives, Inc., a Washington consulting firm. He spent more than 25 years in Federal government service, most recently as director of policy analysis for the Secretary of Agriculture (1979–1981). He was associate director of USDA's Budget and Program Evaluation Office, was legislative assistant for agriculture for U.S. Senator Dick Clark and was Director of the Economic Development Division of USDA-ERS. He holds degrees in Agricultural Economics from Kansas State University and a doctorate in Agricultural Economics from Iowa State University.

**Robert Parker** is a nationally and internationally recognized expert in economic accounting concepts and methods and in U.S. economic statistics. Since retiring from Federal service in 2005, he has been consulting with government, non-profit and business clients. For the Federal government, he served his last five years as Chief Statistician of the Government Accountability Office. Previously he spent 30 years at BEA where he served as Chief Statistician, Associate Director for National Economic Accounts and Chief of the National



Income and Wealth Division. At BEA he was a major contributor to BEA's switch in quantity and

price index number formulas from Laspeyres to Fisher's Ideal. Prior to moving to BEA, he served nine years at the Census Bureau with responsibility for the Enterprise Statistics Program. Mr. Parker is an author and editor of the "Focus on Statistics" columns in *Business Economics*, the quarterly journal of the National Association for Business Economics (NABE). He currently serves as Vice President of the Association of Public Data Users and is a member of the Board of Directors of the Council of Professional Associations for Federal Statistics. He also represents the American Economics Association on the Census Bureau's Professional Advisory Committee. Mr. Parker has served on several statistical review panels, authored numerous official reports for U.S. and international organizations and has held offices in several leading statistical and business organizations. Mr. Parker was the recipient of the Julius Shiskin Award for 1999. He was elected Fellow of the American Statistical Association in 1986.

**Richard S. Sigman** is a senior statistician at Westat. He has over 30 years of experience in statistical methods and research associated with Federal survey programs. Prior to joining Westat, Mr. Sigman was Chief of the Statistical Methods and Sample Design Staff supporting the Economic Statistical Methods and Programming Division at the U.S. Census Bureau. He spent 14 years at USDA, most recently as senior statistician in the Quality Control Branch of the Food and Nutrition Service and prior to that as mathematical statistician in the Research Division of NASS. His career with the Federal Government also includes work with the Social Security Administration and the U.S. Department of Defense. Mr. Sigman earned a master's degree in Statistics at the University of Maryland and a bachelor's degree in Mathematics at Colorado State University.

**William (Bill) G. Tomek** is a professor emeritus, Department of Applied Economics and Management, Cornell University. His teaching and research emphasized topics related to agricultural commodity markets and prices. He is the co-author of *Agricultural Product Prices* (Cornell University Press), now in its fourth edition and of numerous journal articles and monographs. Tomek has received awards from the American Agricultural Economics Association (AAEA)

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*Review of Agricultural Economics*. His research is widely cited and recognized by awards, with Best Article awards in four journals.

He is also a recipient of the Publication of Enduring Quality Award by the American Agricultural Economics Association. He has served as an economic consultant for a number of organizations, including the Research Triangle Institute, the Food and Agriculture Organization of the United Nations and for various law firms in expert witness testimony (including expert witness testimony before the U.S. International Trade Commission). Dr. Wohlgenant has been called upon to be a consultant to the North Carolina legislature on economic issues related to the N.C. swine industry, USDA-ERS and the U.S. Government Accountability Office. He has received numerous awards for his research and teaching, including a William Neal Reynolds Distinguished Professorship. Dr. Wohlgenant was elected a Fellow of the American Agricultural Economics Association in 2001.

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