

# Contractual Relations in the Production and Marketing of Potatoes, Barley, and Wheat in Idaho: A Procedure for an Empirical Analysis

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This paper develops a procedure for a comprehensive analysis of contractual relations in the production and marketing of potatoes, barley, and wheat in Idaho. The procedure focuses on analysis of contract choice by agricultural producers, processors and distributors; evaluation of the effectiveness of contract provisions; and analysis of the behavior of contract parties. The paper presents a review of related literature and a plan of activities to be performed, including the data-collection methods and the types of analyses to be used. The suggested methodology can be used to conduct a similar analysis in any agricultural-commodity market.

Structural changes taking place in the food-supply chain result in an extensive use of production and marketing contracts. For example, the share of the value of crops produced under various types of marketing and production contracts increased from 24.7 percent in 1991–93 to 30.8 percent in 2003 (MacDonald and Korb 2006a). Furthermore, contractual arrangements have become much more complex. Increasing consolidation and concentration in different segments of the food-supply chain, technological progress, food-safety issues, changing consumer preferences, and globalization are some of the important determinants of the evolution of agricultural contracts and of the effectiveness of contractual relations.

An important factor influencing the use of various agricultural contracts has been changes in government support of agricultural producers. During recent years there had been a shift away from commodity price supports to de-coupled direct payments and a greater emphasis on the payments tied to conservation practices and programs. In light of these changes and in anticipation of further policy changes, crop producers should re-evaluate their production and marketing strategies; many of them should consider getting involved in production and

marketing contracts that they did not use before, while accepting government payments.

This paper develops a detailed procedure for a comprehensive analysis of contractual relations in the production and marketing of potatoes, barley, and wheat in Idaho. These crop markets have received very limited attention in the literature. The procedure focuses on analysis of contract choice by agricultural producers, processors and distributors; evaluation of the effectiveness of contract provisions; and analysis of the behavior of contract parties. The next section of the paper presents a literature review, which is followed by a section outlining a procedure for data collection and data analysis.

## Literature Review

Studies that use actual contract data play an important role in understanding the behavior of food-supply-chain participants. The number of these studies is relatively limited, as contract data are confidential in many cases. The majority of the surveyed studies focused on the broiler and pork industries. These industries are characterized by the most extensive use of production contracts. Considerably less attention has been paid to fruits and vegetables, and contractual relations in crop industries have received very limited consideration.

According to the research focus, the surveyed studies can be classified into three major groups. The first group analyzes the choice of a type of a contractual agreement by agricultural producers. The second group focuses on the analysis of contract provisions such as payment systems,

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production practices, quality requirements, delivery conditions, and others. The third group examines various aspects of the behavior of contract parties when contracts are enforced.

Numerous factors influence the choice of a particular contract. Risk-attitude of agricultural producers affects the choice between marketing contracts and production contracts. The purpose of any contract is to serve as a mechanism to share risks between an agricultural producer and a processor (distributor). Several studies focused on the evaluation of various production and marketing risks under different contractual arrangements. Knoeber and Thurman (1995) examined risk shifting under different payment schemes used in the broiler industry, and Martin (1997) analyzed risk shifting in pork-industry contractual arrangements. Hueth et al. (1999) and Wolf, Hueth, and Ligon (2001) examined the price and revenue risks associated with fruit and vegetable contracts.

The other important determinants of the contract choice are contract terms and conditions on sharing responsibilities between producers and processors (distributors), quality requirements, and the type of payment scheme. These aspects influencing the performance of agricultural producers in the hog industry were studied by Johnson and Foster (1994), Parcell and Langemeier (1997), and Gillespie and Eidman (1998). Lajili et al. (1997) analyzed the producers' preferences for various contractual arrangements in the grain industry. Goodhue et al. (2003) studied the producers' choices of contracts conditional on the requirements to the quality of grapes grown in California.

The economic performance of contract parties depends on the clarity and economic effectiveness of the contractual provisions that they have to follow. The most-studied contract provision is the payment system used in various types of contracts. Other contract provisions that received attention in the literature are the contract specific investments, agricultural inputs to be used, production practices to be followed, and contract duration.

In the case of broiler and pork industries, the existing literature focuses on the evaluation of two types of payment schemes. One of them is a relative performance scheme (tournaments) and the other is an absolute performance scheme (fixed-performance).<sup>1</sup> Knoeber (1989) and Knoeber and Thurman (1994) studied tournaments in the broiler

industry. Tsoulouhas and Vukina (1999) focused on the choice of payment systems in the broiler, turkey, and pork industries. Levy and Vukina (2004) examined the welfare effects of tournaments and fixed-performance systems of payments in the broiler industry. Martin (1997) analyzed these two types of payment schemes in the pork industry. Jesse and Johnson (1970) evaluated the effect of the variation in contract provisions on the level of price specified in green pea and sweet corn contracts. Similarly, Sykuta and Parcell (2003) analyzed how variation in the contract terms and conditions influenced specification of the base payment in identity-preserved soybean contracts. Finally, Ahearn, Banker, and MacDonald (2003) examined the impact of contract provisions and producer characteristics on the level of contract price (fee) in corn and broiler contracts.

Studies evaluating performance of contract parties under different contractual arrangements usually focus on analysis of the allocation of decision rights, enforcement of contracts, and the behavior of contract parties. A distinct feature of many contracts is that an integrator (processor or distributor) controls the decision-making process relating to the agricultural input to be used and/or production practices to be implemented. This happens because the integrator's goal is to ensure a steady supply of a product with specific quality characteristics. In these situations, monitoring of performance of agricultural producers is an important step in enforcing these complex agreements. Hueth et al. (1999) and Wolf, Hueth, and Ligon (2001) studied the behavioral aspects of agricultural-input control and quality control in fruit and vegetable contracts in California. Sykuta and Parcell (2003) analyzed allocation of the agricultural input decision rights in the identity-preserved soybean contracts. Leegomonchai and Vukina (2005) tested a hypothesis on possible agricultural-input discrimination in the broiler industry.

Some types of contracts require agricultural producers to make substantial investments in facilities, such as animal houses and warehouses. In

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<sup>1</sup> In the former case, an individual grower's compensation depends on his performance relative to the performance of other growers. In the latter case, an individual grower's compensation is based on his performance relative to a pre-determined standard.

the majority of cases these are contract-specific investments, as they are likely to have little value outside of a particular contract. If for any reason a contract is terminated, agricultural producers are not likely to recover these investments. Vukina and Leegomonchai (2006) analyzed investment behavior of producers involved in the broiler production. A related issue to the investment decisions is the length of a contract. If a contract requires an agricultural producer to invest in a contract-specific asset, the specified length of the contract affects the contract choice and the investment behavior of the agricultural producer. MacDonald and Korb (2006b) analyzed production-contract duration in the broiler industry; in particular, they focused on the incidence of short-term production contracts versus long-term contracts.

This literature review identifies a number of problems that have received limited or no attention in the existing literature. First, contracts in production and marketing of various crops have received a limited consideration. In particular, to the best of our knowledge there are no studies that analyze contractual relations in the potato and barley industries. Second, all existing studies have focused on one or a few relatively narrow problems. No study has developed a comprehensive methodology that could be used to analyze contractual relations in any agricultural market. Third, many data sets used in recent studies are outdated. Furthermore, there are no data sets characterizing contractual relations in the potato and barley industries, which are necessary to study the behavior and performance of contract parties in these markets. The present study develops a procedure for an empirical analysis of contractual relations in the potato, barley, and wheat industries which will be used in future work.

## **Methodology**

### *Stage 1*

A survey of theoretical, empirical, and legal literature analyzing contractual relations in the production and marketing of agricultural products is conducted. The literature to be surveyed includes peer-reviewed journal publications, government reports, court decisions, industry magazines, staff papers, and other relevant publication sources. The crop industries, and specifically the potato, wheat,

and barley industries, are subject to a more comprehensive analysis.

### *Stage 2*

Various types of contracts used in the potato, barley, and wheat industries are collected. Available contracts are analyzed to determine the most common types of contractual agreements and the typical differences among them for each industry. Furthermore, alternative formulations of the most common contract provisions are examined to identify the effects of differences among the alternative formulations on the economic performance of contract parties. This qualitative evaluation of the collected contracts and their terms and provisions is based on comparing and contrasting the types of contracts and the types of contract provisions. In particular, differences in the payment systems, delivery conditions, quality requirements, sharing responsibilities, and storage terms are to be analyzed.<sup>2</sup>

### *Stage 3*

Information obtained at Stage 1 and Stage 2 is used to develop two comprehensive frameworks (methodologies) for analysis of contractual relations in the crop industries. The first framework is used to study the behavior of agricultural producers. The second framework is used to study the behavior of processors and distributors. Each methodology focuses on three major areas.

The first area is analysis of the choice of the type(s) of contractual agreement(s) among those available in the industry. The industry participants use a wide range of marketing and production contracts. Typically, contracts differ due to the degree of an agribusiness company's involvement in the agricultural production and marketing decisions and the type of payment systems used. The characteristics of contract parties and the features of contract provisions affect the choice of a particular agreement in a particular situation.

The second area is evaluation of the effectiveness of the most common contract provisions and of the

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<sup>2</sup> The examples of similar procedures are presented in Hueth et al. (1999), Wolf, Hueth, and Ligon (2001) and Sykuta and Parcell (2003).

alternative formulations of these provisions. The provisions to be considered are the product (service) definitions, specification of the production practices and agricultural inputs to be used, payment systems, quality requirements and grading/weighting procedures, delivery conditions, financial terms, contract duration, dispute resolution, and others. The impact of differences in the alternative specifications of contract provisions on the economic performance (profitability) of the food-chain participants is to be emphasized.

The third area is analysis of the attitude, behavior, and performance of the contract parties when contracts are enforced. Some of the elements to be examined are monitoring of production practices, quality control, advising, trust, and others. A particular focus is on analyzing the problems arising due to improper conduct of contract parties. To identify these problems, the analysis of court decisions conducted at the first stage is to be extended. This approach is useful because it reveals typical problems relating to the enforcement of contracts and to the behavior of contract parties.

#### *Stage 4*

The comprehensive frameworks (methodologies) developed in Stage 3 are adapted to analyze contractual relations in the potato, barley, and wheat industries. In particular, a number of surveys necessary to collect data on the attitude, behavior, and performance of agricultural producers, processors, and distributors in the potato, barley, and wheat industries in Idaho is to be developed and conducted.<sup>3</sup>

#### *Stage 5*

The survey results obtained in Stage 4 are processed to compile the data sets to be used in qualitative and quantitative (econometric) analysis. One of the ways to approach econometric analysis of this type of data is to estimate limited dependent-variable models. The dependent variable in this type of model typically takes a value of 0 or 1; the latter corresponds to the chosen alternative or its incidence. In our case, it would be a choice (incidence) of either

<sup>3</sup> A sample questionnaire is presented in Bolotova and Patterson (2007).

a certain contract type or an alternative formulation of a contract provision.

First, a regression analysis of the choice between production contracts (usually formal written contracts) and marketing contracts (usually oral contracts) is conducted. This choice is the dependent variable in the regression models. The independent variables (determinants of this choice) are the contract provisions, market characteristics, and farmer (company) characteristics. Second, a regression analysis of the incidence of alternative formulations of the selected contract provisions is conducted. The incidence of one of the alternative formulations of a contract provision is the dependent variable in this type of model. The independent variables (determinants of this incidence) are other contract provisions, market characteristics, and farmer (company) characteristics. In cases where only two alternatives are available, a traditional probit or logit model is used. In cases where more than two alternatives are available, an ordered probit (logit) estimation procedure is available.<sup>4</sup> The survey questionnaires include the type of questions that help construct the independent variables.

#### *Stage 6*

A typical set of alternative contractual agreements used in each of the analyzed industries is selected to evaluate the profitability of these alternatives. This analysis is based on evaluation of the costs and benefits associated with each of the alternative agreements. The production budgets and planning prices for potatoes, barley, and wheat in Idaho are available. This information, along with the contract information obtained earlier, is used to develop a number of simulation models to assess profitability of the alternative contract schemes. Furthermore, various sources of production and marketing risks will be introduced in the simulation models to evaluate the profitability of the analyzed contract schemes under the alternative scenarios.<sup>5</sup>

<sup>4</sup> Tsoulouhas and Vukina (1999) used a similar approach to study the choice of the payment systems used in the broiler, turkey, and pork industries. Goodhue et al. (2003) evaluated the choice of the contract forms and of the selected contract provision used in the California wine-grape industry. MacDonald and Korb (2006b) examined the incidence of the long-term contracts versus short-term contracts in the broiler industry. All these studies used the survey data.

## Conclusion

This paper develops a detailed procedure for an empirical analysis of contractual relations in the production and marketing of potatoes, barley, and wheat in Idaho. The procedure focuses on the analysis of contract choice, evaluation of the effectiveness of contract provisions, and analysis of the behavior of contract parties. This paper discusses the data collection methods and the types of analyses to be performed. The suggested methodology can be used to conduct a similar analysis in any agricultural-commodity market.

The purpose of developing this procedure is for it to be used in future studies on contractual relations in crop industries, the results of which could be used in a number of ways. First, the results can help better understand the problems in contractual relations that food-chain participants encounter today. Second, agricultural producers and processors can better understand the contractual relations in which they are involved and how different types of contracts affect their economic performance (profitability). Third, the results could be taken into account when new contracts are developed. Finally, the results of future studies would provide evidence on the performance of contractual relations in the potato, barley, and wheat industries, which could be used in the government decision-making process.

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<sup>5</sup> A similar approach is used in Lajili et al. (1997) to analyze the crop (grain) contracts; Johnson and Foster (1994), Parcell and Langemeier (1997) and Gillespie and Eidman (1998) used similar techniques to study pork industry contractual arrangements.

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