

A Framework for Investigating Issues in Factor Markets and Economic Organization of Russian Agriculture

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1. Introduction

It is evident from history and Russia's resource endowments that agriculture can make a major contribution to the nation's economic growth. Moreover, given the size of Russia's agricultural labor force and the share of the economy committed to agriculture, it will be hard to achieve overall economic growth in Russia without a major contribution from agriculture. The question then is what actions and policies would best promote an increased rate of economic growth in Russian agriculture. In this context, growth means not just increased output, but increased output per person in farming – as for the economy as a whole the single most meaningful growth indicator is GDP per capita. This means getting the most possible out of given resources of land, people, and invested capital; and for sustained growth it means continuing future investment in Russian agriculture.

The purpose of this conference is twofold: to review the state of knowledge on the economics of Russian agriculture, and to lay the groundwork for a program of further research on the situation today, the causes of problems and achievements, and implications for government action and policies. This paper briefly reviews background issues, outlines hypotheses about obstacles to economic growth in Russian agriculture, and discusses analytical approaches to research on these hypotheses in the context of factor markets and economic organization.

2. Background

Since 1991 Russian agriculture has faced economic problems and policy dilemmas as grave as any that have confronted the modern world in peacetime. Liberalization of food commodity prices, in January 1992, introduced market uncertainties at the same time that national government support to agriculture declined from an estimated 11% of GDP in 1992 to 1% of GDP in 1997 (Amelina 2000). Kolkhoz and sovkhoz (both referred to hereafter as “collective farms”) were reorganized, subsidized inputs were not reliably available, provision for pensioners and others on farms was sharply cut back, and private farming was introduced. All these changes occurred differently in different regions, and the pace of change varied greatly among them. The goal of market-oriented reform was the central motivation for changed policies, notably price liberalization and private-sector farming to replace state direction of prices and production, but this goal was not fully shared by many people in agriculture and in government.

The results have been as mixed and inconclusive as the preceding policy story would lead one to expect. Restructuring of former collective farms has not proceeded very far in many areas, and after an initial spurt the growth of private farming has been slow. Neither crop nor livestock output has yet recovered to the levels of 1989-91, and incomes of workers employed in agriculture remained depressed. Yet significant changes have occurred, and some market responses can be observed in the period since the ruble devaluation that accompanied the financial crisis of 1998 (Serova 2000). Output increases have been particularly noted on household subsidiary plots, which have been

enlarged and play an important role, especially where former collective farms are weakest. New arrangements are springing up in which input suppliers or other businesses related to agriculture are establishing vertically integrated or other contractual arrangements with agricultural producers. These arrangements are managing to supply much-needed fertilizer, chemical, and energy inputs in ways more promising than the barter arrangements that have characterized the dealings of many former collective farms and the *ad hoc* and unpriced ways in which owner-employees of these farms often acquire inputs for their own farming enterprises on private plots. Despite the lack of fully developed land ownership rights, rental transactions under which new operators may acquire the use of increased acreage are increasing and are beginning to be economically important.

Many scholars from Russia and around the world have attempted to gauge the post-1991 Russian economy and to make recommendations for spurring economic growth. The agricultural sector has received less attention than some others, but here too there has been a steady stream of attempts to quantify what is happening and why, and to propose appropriate remedies for problems of transition to a market economy. An early comprehensive effort was coordinated by the World Bank at the invitation of the Russian government in November 1991. That effort resulted in a wide-ranging set of studies and recommendations (World Bank 1992a and 1992b) that nonetheless was incomplete in many details. The result was 45 recommendations for food and agricultural policy reform under six headings, of which three had a heavy component of factor market reforms (World Bank 1992a, pp. 10-14). These included a mix of structural reforms (private land ownership, a diversified rural commercial banking system, farm service enterprises for machinery) and short-term managerial changes (shift feed rations in favor of protein feeds, evaluate the energy efficiency of nitrogen fertilizer plants). But prioritization and practical recommendation on how to carry out reforms were scant. Seen from eight years later, it is striking that not many of the recommendations have been followed, while at the same time some objectives of the recommendations have been at least in part achieved by other means – e.g., land rental transactions without full property rights having been established, and lending without formal collateral specifications. The Bank has been criticized for pressing “big bang” reforms that were unattainable and unworkable; but in fact some of their ideas, for example phasing out subsidized credit and transfer of social service responsibilities from former collective farms to governmental bodies, were quite nuanced (even though a 3- to 4-year phase-out period for agricultural subsidies proved far too ambitious). In any event the Bank’s efforts helped mobilize data collection and thinking that until today serve as a useful benchmark against which to compare more recent information and ideas.

In the years since 1992 there have been numerous smaller-scale efforts to survey, analyze, and make recommendations on particular aspects of the Russian agricultural economy. Because of the early liberalization of food commodity prices, and the comprehensive efforts of Russian statistical agencies to collect and publish prices of goods sold in state stores and city markets, several econometric studies of liberalized food market functioning have been published (e.g., Berkowitz, DeJong, and Husted, 1998; Goodwin, Grennes, and McCurdy, 1999; Gardner and Brooks, 1994). These studies indicate how difficult it is to draw conclusions about the extent, effectiveness, and consequences of even quite well documented and widely implemented reforms – so that

even to this day there remains substantial disagreement about how far Russia has gone in establishing a functioning market economy in retail food commodities (particularly with respect to the importance of regional barriers to trade and arbitrage between markets).

With respect to factor markets the informational and statistical base is less well developed. Indeed much of the anecdotal evidence pertains to barter transactions (e.g., a farm trading wheat for fuel with an energy company as counterpart) that suggests a lack of functioning factor markets. Nonetheless there have been formal surveys as well as informal but well informed and organized interviewing efforts that have provided a substantial informational base. The state of knowledge on several key issues is discussed in Serova (1999), Praust (1999), Tarasov (1999), Uzun (1999), and Rilko (1999). And a principal purpose of the present conference is to update and consolidate this information.

3. Hypotheses

Many ideas have been put forth about what the obstacles to agricultural growth in Russia have been. Some key ones are as follows:

- a. Agriculture's problems are the result of low product prices relative to input costs. If farm output could command more input services, the current structure of Russian farming, both new private farms and the "joint stock companies" created from former collective farms, could survive and perhaps even flourish.
- b. Agriculture's problems are the result of incompleteness of the reforms. The assets of collective farms, most notably farmland, have not been distributed to members as private property that can form the nucleus of family farming, and liberalization of product and factor markets has been largely a sham. Thus the collective farm structure remains frozen in place, even though largely non-functioning, and incentives for individuals to take productive action on their own are lacking (beyond their household plots).
- c. Agriculture's problems are the result of trying to change too much, too soon. Reforms have pulled the rug out from under former collective farms by withdrawing governmental support through input supply and drastically reducing the guaranteed market for products that was provided through deliveries to the State.
- d. Agriculture's problems are a result of weaknesses in the rest of the economy. It isn't just that inputs cost too much relative to output, but more fundamentally inputs aren't being made available in sufficient quantity and quality at costs that could be covered by any reasonable prices (e.g., full world prices). There is too much labor on farms to be remuneratively employed in agriculture because of the lack of nonfarm employment opportunities.

In order to focus on these and other hypotheses analytically, it may be helpful to deconstruct them into proximate causes and underlying factors in the Russian agricultural economy. Proximate causes are particular constraints, perceptions, or behavior that work against economic growth. Underlying factors are more fundamental reasons why these constraints, perceptions, or behavior have come to be problems.

Proximate causes of agriculture's problems that could potentially be important include:

1. Technological constraints: given inherent limitations of climate and soils, the technology is not available for Russian agriculture to be fully competitive in the global marketplace – a matter of comparative advantage. A variant of this problem is that appropriate technology could result in a competitive Russian agriculture, but such technology has not been adequately developed; so the problem is more fundamentally human and scientific rather than geophysical.
2. Quantitative constraints on inputs: key factors of production are just not available. Two important sub-categories here are purchased inputs used up in growing a crop, and capital goods. Fertilizers, energy, and crop protection chemicals are candidates as constraining purchased inputs. Lack of credit is a candidate as a constraint on investment in capital goods.
3. Allocative inefficiency. It is possible that given the inputs, capital, and technology that is available, agricultural production is not being carried out efficiently in the sense that inputs are not being allocated to commodities, fields, or over time in the way that maximizes the return that can be achieved from these inputs.
4. Pricing mistakes. It is possible that none of the first three problem areas are so constraining that Russian agriculture could not be much more productive if only agricultural output were not underpriced, or inputs overpriced.

Underlying factors behind all these problem areas are likely to be found in three main areas: the macroeconomic environment, Russian agricultural policies and government institutions, and conditions inherent in the historical situation of Russian agriculture. The macroeconomic environment includes not only instability and uncertainty created by inflation and tax policies, which affect the value of the ruble in international exchange and the feasibility of well functioning credit markets, but also the foreign trade regime including policies of other countries such as US and EU shipments of agricultural goods to Russia on concessional terms. Agricultural policies and institutions comprehend not only national policies with respect to credit, arrears of former collective farms, and so forth, but also regional policies in input and output pricing, marketing, and movement of goods, and fundamental elements such as laws governing ownership of and transactions in land and other property.

4. Analytical Approaches

The preceding is a very general conceptual framework. What we need to put it to work are procedures for investigating the various hypotheses that have been outlined, and others. The first step of course is obtaining the relevant facts – not only of prices and quantities of outputs and inputs, but disaggregated facts about input use and output production in different regions, for different types of farming operations, and at different times under various constraints.

In beginning to scope out specific obstacles to growth in agriculture, a possibly rewarding approach is to look for situations where inputs have a high value of marginal product relative to input costs, and for ways to increase investment in those inputs by farms. In a fully equilibrated, competitive market economy, such opportunities for profit would be exhausted, and the value of each input's marginal products would just equal its cost – an additional 100 rubles spent on fertilizer would generate 100 rubles worth of additional

output. This situation rarely occurs exactly in a dynamic economy because technology and economic forces keep changing in ways that can't be anticipated. But it seems likely that in Russia at present there are some particularly large departures from equilibrium, because of constraints agricultural producers face in product and input markets.

The papers at this conference, and the research efforts to follow up on them, all deal with input markets. This limitation helps in achieving a unified and manageable set of topics which are nonetheless focused on perhaps the most fundamental set of constraints and opportunities in Russian agriculture today. The idea in each area is to

mobilize the most relevant available factual evidence, to analyze the existing literature and evidence in each area pertinent to the hypotheses listed above, and to assess possible policy changes to improve the performance of input markets and open up opportunities for profitable input use and investment in agriculture. For discussion at this conference, the approach more concretely is as follows for each topic:

1. Assess the current state of knowledge and cite relevant literature on the subject, with Russian colleagues covering Russian sources of information and Americans, where possible, bringing in non-Russian findings and literature relevant to the topic.
2. Assess data and data sources that bear on the topic, including reliability, accessibility, and level of aggregation of data. If appropriate data are unavailable or unreliable, what can be done to obtain data needed to credibly address the issues?
3. Analyze, so far as possible, the reasons for the existing situation. What constraints are imposed upon the growth of agricultural output, productivity, and incomes of farm people? What are the causes of such constraints: policies, absence of appropriate institutions, historical legacy, or other? What are the implied hypotheses for further testing in the course of future research?
4. Identify and discuss details of a research strategy for the topic. How can questions about unresolved issues be answered? Indicate a specific research plan, including for example, collection of oblast-level data that could test hypotheses using statistical analysis of variation across observations. In such cases, what regions are best to focus on? What information should be obtained in survey work?
5. Discussion of policy implications of hypotheses or of existing literature on the topic.

For example, the following approach applies methods developed by the Economic Research Service of USDA. Using factor supply and demand models widely applied in the literature, one can examine whether changes in the agricultural labor force in a region is correlated with the difference between the wages paid to agricultural and nonagricultural workers. A key empirical challenge is measuring the real wage of agricultural workers, which can include monetary payments, in-kind payment of agricultural output, and the social-welfare services collective farms provide (health, education, housing, and entertainment). The real wage can then be compared to the value of a worker's marginal product, which itself has to be estimated from disaggregated input, output, and price data. One can then determine how far any gap between wages and the value of marginal product of labor goes to explain the current unprofitability widely

reported for former collective farms, as well as measured efficiency and other farm performance indicators. The work that ERS has done in estimating agricultural production functions by region would be helpful in this research, as the production functions allow estimation of labor's marginal product (Sedik et al., 1999).

In drawing inferences from published data and from further data that will be collected, it may be helpful to distinguish two modes of economic analysis. The first focuses on physical quantities, and the second focuses on values or prices. With physical quantities one can estimate ratios of inputs (e.g., workers per acre), outputs to inputs (average products), or production functions (marginal products). With prices only one can estimate relative values of inputs and outputs, as for example in Serova, Karlova, and Petrichenko (2001), Table 1 where Russian and US price ratios are compared. Price ratios can give indications of how markets and policies are working, so for example the finding that input/output prices are higher in Russia than in the U.S. indicates a tougher economic situation for Russian producers.

For the most useful indicators it is necessary to use a mix of quantity and prices data. Even for quantity comparisons themselves, in order to aggregate outputs or inputs, to measure sector-wide output or aggregated inputs, or multifactor productivity (the only productivity measure that really matters for gauging efficiency), we need a way to weight the outputs and inputs aggregated, and the sensible way to do this is using base-period prices or values of the outputs and inputs. For estimation of profits or returns to residual factors of production (owned land and labor, mostly) we have to use quantity and price data on an equal footing, current prices multiplied by current quantities, and any data problems become harder to trace and evaluate. Similarly, to apply the test for efficiency in input application that the value of an input's marginal product should equal the input's price, we multiply physical marginal product (from quantity data) by product price.

A problem with drawing analytical conclusions from such data is that even seemingly straightforward data manipulation, as in aggregation, requires an assumption of competitive equilibrium and/or profit maximization by producers. These assumptions may not hold. In a famous paper on explaining agricultural productivity growth in the United States, Griliches (1963) carried out a study of measured technological change during the period of its strongest acceleration, 1940-1960, in which he showed that economic assumptions matter a great deal in how multi-factor productivity measurement is carried out. He estimated that labor added less to the value of output than the market value (measured by the farm wage) of labor used. This implies that farmers in aggregate were not profit-maximizing — their net income would have been increased if they hired less labor or reallocated some of their household's own time to nonfarm uses that earned the farm wage rate. Moreover, he found that additional output generated by capital in agriculture exceeded the cost of capital. In both of these findings he confirmed observations of T.W. Schultz (1947) that disequilibrium in labor and capital use on farms existed in the sense that there was too much labor and too little capital given the technological changes that had occurred.

The result is that Griliches used a weight of .33 on labor and .26 on power and machinery in aggregating inputs, while USDA's price-weighted index used weights of .40 and .14, respectively (Griliches 1963, p. 336). Because the farm labor force was rapidly declining in 1940-60, while capital was increasing (which is what the disequilibrium argument

would predict), this difference in weights made a difference in the measured growth of aggregate inputs. Griliches estimated that aggregate inputs in agriculture grew by 14 percent over the 20-year period, while the USDA input measure grew by 5 percent. Moreover, he found substantial economies of scale: he estimated that increasing all inputs by 10 percent generated an increase in output of 13.6 percent. This is also an indicator of disequilibrium, in the sense that farm size would be expected to grow to the scale at which such economies of scale disappeared.

Griliches' estimates imply that disequilibrium and economies of scale account for 1.5 percent of the 2.0 percent annual productivity growth indicated by the USDA statistics in 1940-1960. This is not to say that the USDA measure is wrong, but just that MFP measurement is sensitive to economic assumptions as well as statistical data problems, and that what is measured is not just changes in technology.

5. Specific Topics:

The subjects to be investigated include:

1. Purchased Inputs (Machinery, Energy, Fertilizer, Chemicals, Seeds)
2. Land: Markets and Contracting
3. Credit/Finance and Investment in Agriculture
4. Labor: Markets, Skills and Non-agricultural Opportunities
5. Household Farming
6. Vertical Integration, Contracting, and Related Innovations

After considering the facts and analyses for each of these areas, we hope to be able to make an overall data-based analysis and assessment of the general hypotheses listed above. More practically important, we hope to be able to propose particular policies and government investments that will place Russian agriculture in a position to realize its great potential to grow and prosper.

Difficult issues of knowledge and interpretation arise in each of the three areas of facts, analysis, and policy implications.

Laying out the facts of the current situation would seem the most straightforward part of our agenda. The largest part of each of the papers is in fact devoted to statistical data and other factual information. One's first reaction to seeing such facts is gratitude: now we can see and quantify what is happening. One's second reaction is questioning: are the data correct and are they representative? Uzun points out that two different sources, both from Goskomstat, give the 1999 output of small agricultural enterprises as 15.4 billion rubles in one case and 4.7 billion rubles in another (Table 8). Uzun also points out complications in how much land is actually used private household plots for crops including forage and grazing. Similarly, one could ask about the precision of estimates reported in Kiselyov about the labor force on personal subsidiary plots increasing by 2.6 million since 1990. Data on profitability and other derived economic concepts raise questions of definition as well as accuracy. It is also notable that the arrangements and institutions described in Rylko's paper do not appear to be visible in the aggregate Goskomstat data, and he goes so far as to say "Russian agricultural and agribusiness

statistics must be redesigned to reflect the new production patterns” (Rylko, section on Further Research Priorities). The question then is what use can we make of the statistics as they are?

Analysis of the reasons for facts and trends being as they are involves additional difficulties. Uzun notes that farm enterprises descended from collective farms tend to earn losses. Moreover Russian agriculture in the 1990s generated decreases in output per person employed and in output per hectare (Serova, Karlova, and Petrichenko, Table 2). With the discussion in Uzun, these facts point to hypothesis (b) above, that Russian agriculture has suffered because of incompleteness of reforms which should have moved land and other resources out from under inefficient enterprises. But, if (b) is correct, we should see private farming flourishing, since their competitors are so weak. Yet it is clear that private farming has had big problems too.² With the relative price data in Serova, Karlova, and Petrichenko, it seems that we cannot neglect hypothesis (a), that if product prices were higher relative to input prices, that would go a long way to solve agriculture’s problems. But again, since the big ruble devaluation of 1998 we have seen agricultural product prices rise relative to nontraded factor prices (land and labor); yet while the economic picture has improved it seems clear this hasn’t solved agriculture’s problems either. I hope our discussions today and tomorrow will help clarify what is going on, and more importantly will point the way toward obtaining more solid answers to questions about the situation, outlook, and appropriate policies for Russian agriculture in the future.

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² On the problems of private farms, and even more household subsidiary plots, the issue of economies of scale arises. One way to throw more light on this issues might be through the enterprise data used by Uzun in developing his interesting comparisons of subsets of enterprises and “clubs” of top performers. For example, the “AGRO-300” club of the top 1.1% of farms is much bigger than average in sales, employment, and assets. Is that because of technical economies of scale or because of good management on these farms which then enabled them to retain and attract assets?

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