



*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

*No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.*

**האוניברסיטה העברית בירושלים**  
**The Hebrew University of Jerusalem**



**המרכז למחקר בכלכלה חקלאית**  
**The Center for Agricultural**  
**Economic Research**

**המחלקה לכלכלה חקלאית ומנהל**  
**The Department of Agricultural**  
**Economics and Management**

**Discussion Paper No. 14.04**

**Agricultural Labor in Russia:  
Efficiency and Profitability**

**by**

**William M. Liefert, Zvi Lerman, Bruce Gardner**  
**and**  
**Eugenia Serova**

Papers by members of the Department  
can be found in their home sites:

מאמרים של חברי המחלקה נמצאים  
גם באתרי הבית שלהם:

<http://departments.agri.huji.ac.il/economics/indexe.html>

P.O. Box 12, Rehovot 76100

ת.ד. 12, רחובות 76100

# Agricultural Labor in Russia: Efficiency and Profitability

William M. Liefert<sup>1</sup>, Zvi Lerman<sup>2</sup>, Bruce Gardner<sup>3</sup>, and Eugenia Serova<sup>4</sup>

During Russia's transition from a planned to a market economy, its agricultural labor force has declined by about a fifth. At the same time, the number of employed in Russia's corporate farms – the successors of collective and state farms from the Soviet era – has fallen by 60 percent. This paper examines the allocative efficiency of Russia's use of labor in large-scale corporate agriculture, and analyzes whether the decline in labor use has been economically rational.

## Methodology and Data

We assess the allocative efficiency (AE) of labor use by comparing labor's price (or wage,  $W$ ) with the value of labor's marginal product in producing commodity  $j$  ( $VMP^j$ ).  $VMP^j$  equals the marginal product of labor used to produce  $j$  ( $MP^j$ ) times the price of  $j$  ( $P^j$ ). Russian farms will be using labor at the allocatively efficient, as well as profit-maximizing, level when:

$$(1) \quad W = VMP^j = MP^j \cdot P^j$$

If  $W > (<) VMP^j$ , the farm should decrease (increase) use of labor in order to improve allocative efficiency (and profit). We present the results of our AE analysis in terms of the AE ratio, calculated as the ratio of  $VMP^j$  to  $W$ . When the ratio  $> (<) 1$ , the use of labor should be increased (decreased).

The results examined in this paper are from work by researchers involved in the BASIS (Broadening Access and Strengthening Input Market Systems) project on Russian agricultural input markets. The project is funded by the U.S. Agency for International Development, and involves collaboration between a number of Russian and Western agricultural specialists (including the authors of this paper). All the AE calculations examined pertain to the behavior of the large former state and collective farms in Russia. This means that the volume of inputs used in estimating the production functions on which the AE calculations are based are the volumes used by the farms in their corporate operations, while the output used in estimating the production functions are correspondingly the levels of output from farms' corporate operations. Input use and output by the household plots associated with these farms are excluded in estimating the production functions.

The calculations of the BASIS researchers vary with respect to the regions covered. Uzun's AE analysis covers all Russia, while Lerman's pertains to the three

---

<sup>1</sup> USDA Economic Research Service, Market and Trade Economics Division. Washington, DC.

<sup>2</sup> Department of Agricultural Economics and Management, The Hebrew University of Jerusalem.

<sup>3</sup> Department of Agricultural and Resource Economics, University of Maryland, College Park, MD.

<sup>4</sup> Analytical Centre for Agri-food Economics, Moscow.

oblasts (combined) for which a detailed farm survey was conducted as part of the BASIS project—Rostov, Ivanovo, and Nizhnii Novgorod. Epshtein's analysis is specific to Leningrad oblast. All the studies are specific to the year 2001.

The data for wages and output prices used in the AE tests pertain to the specific regions covered in each analysis. The wage and price data used by Lerman for Rostov, Ivanovo, and Nizhnii Novgorod are from the farm survey conducted within the BASIS project. The wage and price data used by Uzun and Epshtein are from the Russian Federation State Committee for Statistics and cover the agricultural sector as a whole.

Key information needed for the AE analysis is labor's MP. All MP values used in the AE tests are from econometrically estimated production functions, computed by BASIS project researchers for the specific regions covered by their work. All marginal product estimates used in the AE tests are from econometrically estimated generalized Cobb-Douglas functions explaining the value of farm output. Multiplying the estimated coefficient for labor in the Cobb-Douglas function by labor's (geometric) mean product gives labor's estimated VMP.

## Results

Table 1 presents the AE calculations.<sup>5</sup> Three different results are presented from work by Lerman for crops. He achieves different results depending on how he models material inputs in estimating the production functions used in his AE calculations. In the first instance (identified in footnote #3 in table 1), material inputs are not disaggregated, and are measured in rubles. In the second instance (footnote #4 in table 1), fertilizer and seeds replace aggregated material inputs in the specification of the production function, with both inputs measured in rubles. In the third instance (footnote #5 in table 1), fertilizer and seeds again replace aggregated material inputs, but with only seeds measured in rubles and fertilizer in physical units.

The results suggest a general, though not large, underuse of agricultural labor within Russia, with most of the AE ratios exceeding 1 by 20-40 percent. For example, the AE calculation by Uzun covering total agricultural output in all Russia suggests that employing more agricultural workers would raise farms' revenue by about 20 percent more than the cost of employing the workers. Increasing employment would thereby raise farm profit (or if farms are unprofitable, reduce their losses). In 2001, 46 percent of Russian farms were unprofitable (Russian Federation State Committee for Statistics, table 15.8); movement to the profit-maximizing volume of labor might thereby reduce that figure.

Results showing that agricultural labor is underused rather than overused might seem surprising, given the commonly held belief that Russian agriculture suffers from a surplus of unskilled, aged, and demoralized labor force. One reason for the finding of apparent underuse of labor is that, because of data and measurement issues, the VMP

---

<sup>5</sup> Lerman's results are from M. Grazhdaninova and Z. Lerman (2005). The results of Uzun and Epshtein are unpublished and can be obtained (in Russian) from the authors on request, as can be the work by Sazonov cited later in the article.

estimates used in the AE calculations in table 1 are biased upward. One bias results from the fact that most of the studies are for 2001, a good weather year for grain production, with output at 82 million metric tons (mmt), compared to average annual production over 1996-2003 of 68 mmt (USDA). Using the results for 2001 to assess performance for a broader period of time around this year would bias labor's VMP upward if good weather increases the slope as well as the intercept of the production function. As mentioned before, the results in table 1 cover the operations of the former state and collective farms, which specialize in producing grain and other bulk crops (Russian Federation State Committee for Statistics, table 15.7). This bias is therefore more important in analyzing their operations than it would be for the household plots which specialize in livestock products, potatoes, and vegetables.

**Table 1. Allocative efficiency calculations for labor in corporate farms (2001)**

Researcher	Output	Region	AE ratio <sup>1</sup>
Uzun	All agriculture	All Russia	1.19
Lerman	All agriculture	3 survey regions <sup>2</sup>	1.28
Lerman <sup>3</sup>	Crops	3 survey regions	1.12
Lerman <sup>4</sup>	Crops	3 survey regions	0.97
Lerman <sup>5</sup>	Crops	3 survey regions	1.32
Lerman	Livestock products	3 survey regions	1.28
Epshtein	All agriculture	Leningrad	1.38

<sup>1</sup>Ratio of input VMP to input price.

<sup>2</sup>Rostov, Ivanovo, and Nizhnii Novgorod.

<sup>3</sup>No disaggregation of material inputs, all measured in rubles.

<sup>4</sup>Fertilizer and seeds replace aggregated material inputs, both measured in rubles.

<sup>5</sup>Fertilizer and seeds replace aggregated material inputs, with seeds measured in rubles and fertilizer in physical units.

Another bias in the AE calculations is that the studies cited in table 1 understate the real wages earned by workers. The effect is to increase the AE calculations, therefore again biasing the results in the direction of underuse of labor. The former state and collective farms continue the obligation that existed during the Soviet period of providing social welfare services needed by their workers, such as health care, schools, housing, and recreation. In the AE calculations, the value of these services should be included in workers' real wages. It appears that both the quality and quantity of such services provided by farms have been steadily declining, and the process of transferring these responsibilities from farms to local governments is beginning in some areas. Also, the farm survey of the three oblasts (Rostov, Ivanovo, and Nizhnii Novgorod) done as part of the BASIS project tried to include such services in measuring real wages for workers. Nonetheless, it is likely that the various studies did not capture the full value of such benefits received by farm workers.

Another likely reason why real labor remuneration is understated is that workers on the large farms receive not only monetary wages and services from their employing farms, but also in-kind payment. All households on these farms continue to operate their own plots, which average about 0.4 hectares in size (see Liefert). While the corporate

operations of the large farms produce most of Russia's bulk crops (grain, oilseeds, sugar beets), the plots account for over half of the country's output of meat, potatoes, and vegetables, and about half of milk production (Russian Federation State Committee for Statistics, table 15.7).

A reason for the plots' striking performance is that the plotholders receive as either in-kind payment, or in some cases steal, inputs from their parent farms. Given that the plots specialize in livestock operations, inputs commonly transferred to plot use in this way are animal feed, use of vehicles by households to truck output to farmers' markets for sale, and fuel for the vehicles. Some fertilizer and seeds are also probably transferred, and grazing of plot animals on communal farmland is also common.

The value of inputs transferred to use on household plots should be included in workers' real wages. Yet, given that much of the input transfer is unofficial, fully accounting for such reallocation is virtually impossible. The effect is that workers' real wages are understated, thereby again biasing the AE calculations upward. In work in the Mtsensk District of Orel Oblast, Bogdanovskii finds that the value of farms' in-kind transfers and social welfare services to workers would increase base wages by 20-25 percent. Most of the AE calculations for labor show VMP values exceeding wages by 20-40 percent. If Bogdanovskii's markup for agricultural real wages applies to the entire country, it would appear that real wages are fairly close to workers' VMP.

If, despite these upward biases in the AE calculations, agricultural labor's real VMP does in fact exceed its real wage, a possible explanation is that, although farms might have a surfeit of older and unskilled workers, they have a shortage of skilled workers. Scarce skills would include proficiency in machinery use and repair, animal care (including knowledge of modern breeding and feeding practices and veterinary services), and low to middle level management activities. The farm survey done for this project (in Rostov, Ivanovo, and Nizhnii Novgorod Oblasts) indicates this might be the case. Another supporting point is that a disproportionate share of the labor migration out of agriculture during the transition period has been among younger and better-educated workers.

Another reason why Russian agricultural workers' VMP might exceed their real wage is that farms have market power in setting pay levels. The earlier examination of farms' profit-maximizing level of labor use (equating labor's wage to its VMP) was based on the assumption that farms lack such market power vis-à-vis labor, such that the wages they pay are set by the "market." If farms have market power, however, the profit-maximizing condition for labor use is equating labor's VMP not with the real wage paid, but rather with the marginal cost of employing labor. If an employer has market power, this cost increases as employment rises (reflecting an upward sloping supply curve for labor). Profit-maximization under such circumstances results in less labor hired at lower wages compared to competitive conditions.

Few employment opportunities exist in the Russian countryside outside of the large former state and collective (corporate) farms. Farm workers also face difficulties in migrating to cities, such as obtaining permits to settle, finding low-cost housing, and most importantly finding employment (given their lack of marketable skills). Farm management might be helped in setting low wages in that the decision whether to uproot

one's life by leaving the farm for uncertain employment in a distant city, especially in Russia's difficult economic conditions, might not be sensitive to marginal changes in the real wages paid by farms. With de facto market power, farms would maximize their profit by not hiring more workers even if their VMP exceeded the observed market wage rate.

The above analysis applies to Russia's corporate farms. Bogdanovskii argues that household plots and peasant farms (the latter accounting for less than 5 percent of total agricultural output; Russian Federation State Committee for Statistics, table 15.3) have surplus labor. He maintains that corporate farms are offloading unproductive workers by terminating their employment with the farms' corporate operations, leaving the workers with only their private plots. Although Bogdanovskii performs no AE tests of his surplus labor argument, he provides empirical support by stating that among 24 million people employed in subsistence-oriented household plots, the average work-year is a mere 40 percent of the work-year in corporate farms. In peasant farms and commercially oriented household plots, the work-time ratio is only slightly better (55 percent). Sazonov supports the argument that peasant farms employ surplus labor by computing an AE ratio of 0.28 for such farms in Tambov Oblast in 2001-02.

### **Policy Options**

A number of policy interventions appear appropriate in the present circumstances. First, rural local government should take over the responsibility from corporate farms of providing social welfare services such as health care, education, and recreation. This would relieve farms of this financial burden, as well as guarantee the provision of minimal services to the rural population. Second, the large cohort of subsistence farmers working on their household plots as their main or sole occupation should be given the legal status of "economically employed." This would give them all associated rights for pensions, medical insurance, unemployment benefits, and other forms of social protection. Third, in order to increase rural employment opportunities, the government should promote the growth of small businesses, through credit facilities, tax breaks, and simplification of administrative requirements for small business creation. Fourth, education and training programs should be established to teach the rural population relevant marketable skills.

### **Conclusion**

The results indicate that by 2001 Russian corporate farms were underusing labor from the point of view of allocative efficiency and farm profit maximization, though not substantially so. This suggests that the 60 percent drop in labor use by these farms during transition has gone too far, such that farm profitability would improve if employment rose. Yet, for a number of reasons the AE calculations are biased in the direction of labor underuse. The results and qualifications in sum suggest that allocative inefficiency in Russia's use of agricultural labor is slight. Also, a possible reason why labor's VMP exceeds its real wage is that farms are using their market power vis-à-vis labor to pay

wages below more competitively-determined levels. Although such behavior hurts allocative efficiency, it is in farms' profit-maximizing interest.

### **Acknowledgements**

The section of the paper **Methodology and Data** draws on material from W. Liefert, "The Allocative Efficiency of Material Input Use in Russian Agriculture," forthcoming in *Comparative Economic Studies*. The views expressed are the authors' alone and do not represent the official views or policies of their employing institutions.

### **References**

- Bogdanovskii, V. "Agricultural Employment in Russia 1990-2002." *Comparative Economic Studies* 47(March 2005, forthcoming).
- Grazhdaninova, M. and Z. Lerman. "Allocative and Technical Efficiency of Corporate Farms in Russia." *Comparative Economic Studies* 47(March 2005, forthcoming).
- Liefert, W.M. "Agricultural Reform: Major Commodity Restructuring but Little Institutional Change." In: *Russia's Uncertain Economic Future*, ed. J.P. Hardt, ed., Joint Economic Committee, U.S. Congress, Washington DC, 2001, pp. 253-281.
- Russian Federation State Committee for Statistics. *Rossiiskii Statisticheskii Ezhegodnik 2003 (Russian Statistical Yearbook 2003)*. Moscow (2003).
- U.S. Dept of Agriculture (USDA). *Production, Supply and Distribution (PS&D)*. [www.fas.usda.gov/psd/](http://www.fas.usda.gov/psd/)



## PREVIOUS DISCUSSION PAPERS

- 1.01 Yoav Kislev - Water Markets (Hebrew).
- 2.01 Or Goldfarb and Yoav Kislev - Incorporating Uncertainty in Water Management (Hebrew).
- 3.01 Zvi Lerman, Yoav Kislev, Alon Kriss and David Biton - Agricultural Output and Productivity in the Former Soviet Republics.
- 4.01 Jonathan Lipow & Yakir Plessner - The Identification of Enemy Intentions through Observation of Long Lead-Time Military Preparations.
- 5.01 Csaba Csaki & Zvi Lerman - Land Reform and Farm Restructuring in Moldova: A Real Breakthrough?
- 6.01 Zvi Lerman - Perspectives on Future Research in Central and Eastern European Transition Agriculture.
- 7.01 Zvi Lerman - A Decade of Land Reform and Farm Restructuring: What Russia Can Learn from the World Experience.
- 8.01 Zvi Lerman - Institutions and Technologies for Subsistence Agriculture: How to Increase Commercialization.
- 9.01 Yoav Kislev & Evgeniya Vaksin - The Water Economy of Israel--An Illustrated Review. (Hebrew).
- 10.01 Csaba Csaki & Zvi Lerman - Land and Farm Structure in Poland.
- 11.01 Yoav Kislev - The Water Economy of Israel.
- 12.01 Or Goldfarb and Yoav Kislev - Water Management in Israel: Rules vs. Discretion.
- 1.02 Or Goldfarb and Yoav Kislev - A Sustainable Salt Regime in the Coastal Aquifer (Hebrew).
- 2.02 Aliza Fleischer and Yacov Tsur - Measuring the Recreational Value of Open Spaces.
- 3.02 Yair Mundlak, Donald F. Larson and Rita Butzer - Determinants of Agricultural Growth in Thailand, Indonesia and The Philippines.
- 4.02 Yacov Tsur and Amos Zemel - Growth, Scarcity and R&D.
- 5.02 Ayal Kimhi - Socio-Economic Determinants of Health and Physical Fitness in Southern Ethiopia.
- 6.02 Yoav Kislev - Urban Water in Israel.
- 7.02 Yoav Kislev - A Lecture: Prices of Water in the Time of Desalination. (Hebrew).

- 8.02 Yacov Tsur and Amos Zemel - On Knowledge-Based Economic Growth.
- 9.02 Yacov Tsur and Amos Zemel - Endangered aquifers: Groundwater management under threats of catastrophic events.
- 10.02 Uri Shani, Yacov Tsur and Amos Zemel - Optimal Dynamic Irrigation Schemes.
- 1.03 Yoav Kislev - The Reform in the Prices of Water for Agriculture (Hebrew).
- 2.03 Yair Mundlak - Economic growth: Lessons from two centuries of American Agriculture.
- 3.03 Yoav Kislev - Sub-Optimal Allocation of Fresh Water. (Hebrew).
- 4.03 Dirk J. Bezemer & Zvi Lerman - Rural Livelihoods in Armenia.
- 5.03 Catherine Benjamin and Ayal Kimhi - Farm Work, Off-Farm Work, and Hired Farm Labor: Estimating a Discrete-Choice Model of French Farm Couples' Labor Decisions.
- 6.03 Eli Feinerman, Israel Finkelshtain and Iddo Kan - On a Political Solution to the Nimby Conflict.
- 7.03 Arthur Fishman and Avi Simhon - Can Income Equality Increase Competitiveness?
- 8.03 Zvika Neeman, Daniele Paserman and Avi Simhon - Corruption and Openness.
- 9.03 Eric D. Gould, Omer Moav and Avi Simhon - The Mystery of Monogamy.
- 10.03 Ayal Kimhi - Plot Size and Maize Productivity in Zambia: The Inverse Relationship Re-examined.
- 11.03 Zvi Lerman and Ivan Stanchin - New Contract Arrangements in Turkmen Agriculture: Impacts on Productivity and Rural Incomes.
- 12.03 Yoav Kislev and Evgeniya Vaksin - Statistical Atlas of Agriculture in Israel - 2003-Update (Hebrew).
- 1.04 Sanjaya DeSilva, Robert E. Evenson, Ayal Kimhi - Labor Supervision and Transaction Costs: Evidence from Bicol Rice Farms.
- 2.04 Ayal Kimhi - Economic Well-Being in Rural Communities in Israel.
- 3.04 Ayal Kimhi - The Role of Agriculture in Rural Well-Being in Israel.
- 4.04 Ayal Kimhi - Gender Differences in Health and Nutrition in Southern Ethiopia.
- 5.04 Aliza Fleischer and Yacov Tsur - The Amenity Value of Agricultural Landscape and Rural-Urban Land Allocation.

- 6.04 Yacov Tsur and Amos Zemel – Resource Exploitation, Biodiversity and Ecological Events.
- 7.04 Yacov Tsur and Amos Zemel – Knowledge Spillover, Learning Incentives And Economic Growth.
- 8.04 Ayal Kimhi – Growth, Inequality and Labor Markets in LDCs: A Survey.
- 9.04 Ayal Kimhi – Gender and Intrahousehold Food Allocation in Southern Ethiopia
- 10.04 Yael Kachel, Yoav Kislev & Israel Finkelshtain – Equilibrium Contracts in The Israeli Citrus Industry.
- 11.04 Zvi Lerman, Csaba Csaki & Gershon Feder – Evolving Farm Structures and Land Use Patterns in Former Socialist Countries.
- 12.04 Margarita Grazhdaninova and Zvi Lerman – Allocative and Technical Efficiency of Corporate Farms.
- 13.04 Ruerd Ruben and Zvi Lerman – Why Nicaraguan Peasants Stay in Agricultural Production Cooperatives.
- 14.04 William M. Liefert, Zvi Lerman, Bruce Gardner and Eugenia Serova - Agricultural Labor in Russia: Efficiency and Profitability.