

Project Description

Russian agriculture has been in trouble all too long. And while there has been no shortage of explanations for its numerous failures, these explanations have for the most part invoked incentives, ownership, spontaneous and enforced communal forms, management, legal issues, and other derivatives of a dominant socio-economic order. However, neither feudalism, nor state socialism nor, for that matter, market economy -- with peasant commune, collective farm, and joint-stock company as their respective agricultural microcosms -- has brought about the ultimate salvation of farming, the backbone of rural economy in Russia. Two world wars traumatized it, but the on-going post-communist transition has brought about production setbacks quite comparable to those caused by the wars. In terms of officially reported output, Russian agriculture is now 40% below its former level on the eve of the current economic reform (1990). And although the most recent (2000) harvest was much better than the two previous ones, it is far from certain that we are witnessing the beginning of a great recovery. It is also highly unlikely that the meager economic outcomes of the 1990s derive from staunch resistance to reform on the part of the so-called agrarian lobby, the widespread opinion aptly criticized by Stephen Wegren (2000). To his criticism we would add that growth in output has occurred in regions with minimum reform adjustments (e.g., Tatarstan and Bashkortostan). At the same time regions recently touted as instituting groundbreaking changes in farm management under the guidance of Western financial donors (e.g., Nizhni Novgorod) fare worse than before [Ioffe, Nefedova 2000(a)].

Under the Soviets agriculture malfunctioned as well, and it has been a widely accepted view that farming does not lend itself to central planning (Stuart 1983, pp. 13-14). Although czarist Russia was a net exporter of food, yields were meager and the countryside was viewed as the bastion of cultural continuity imbued with communal lethargy and resistance to market processes (Robinson 1957). We share the view that the collectivization of agriculture under the Soviets would have never succeeded in the first place without this communal streak inherent in Russian peasantry [Ioffe and Nefedova 1997(a)]. However, that only implies that neither the 1929-35 collectivization, nor its blanket rejection in 1991, can be construed as root causes of Russian agrarian woes.

Far from denying the significance of aspatial explanatory frameworks (e.g., political economy, legal, managerial, technological, etc.) in these travails, this project explores the idea of agricultural development constraints inherent in Russia's environment (physical and social alike). That low efficiency and poor outcomes have been the scourge of the Russian countryside irrespective of dominant socio-economic order may, if only in part, derive from the neglect of these objective constraints.

The ultimate goals of this project are to uncover such constraints with strong spatial dimensions, to understand their implications, and to evaluate prospects for Russia's agricultural development through the prism of these constraints.

The project breaks down into four steps that are designed to realize this goal. Step 1 is to evaluate and juxtapose three agricultural constraints that deal with a) natural environment, b) excessive land under cultivation, and c) demographics.

Step 2 is to characterize and evaluate two major factors/predictors of agricultural variance, factors of environmental and social nature, within the non-marginal agricultural space. Agricultural variance and its factors form the common thread of the project. In their extreme version they impose development constraints, in their moderate version they still have sundry implications, most notably specialization and land use intensity.

Step 3 is to analyze core-periphery gradients of agricultural land use intensity around Russian cities, the task in line with the social predictor of spatial variance.

Finally, Step 4 views the potential of Russia's agricultural revival through the prism of the above-mentioned constraints and spatial variance.

These steps are described in detail below. The study area for steps 1 and 2 is going to be all of European Russia; Steps 3 and 4 are going to be limited to selected regions within European Russia.

Constraints of agricultural development (Step 1)

Physical Environment

“Russian farmers have to contend with some of the worst climates faced by farmers anywhere” (Symons 1990, p. 126). This especially pertains to winter temperatures, length of the growing season, depth of freezing, and the erratic patterns of cold blasts and thaws. The comparative analysis of the environmental conditions for agriculture that set Russia apart from much of Europe and North America used to be a popular topic of 19th century Russian and European scholars (e.g., Kliuchevsky 1904, Hettner 1905, etc.). Such comparisons are rare these days. To our knowledge, they have not been called upon over the last thirty-five years by Western Sovietology experts assessing the performance of Russian agriculture.¹

This stands in peculiar contrast to the wealth of relevant environmental data available. In 1968, N.C. Field actually used some of these data in his superb but rarely cited comparison of the agricultural land bases of the USSR and North America. According to Field, “environmental quality must be weighed heavily in assessing the relative productivity of the agricultural land resources of the Soviet Union and North America (Field 1968, p. 11.) One must be... cautious in attributing largely to the human factors differences in the per acre returns” (Ibid.). Field showed that in the USSR four-fifths of the cropland fell within the least productive thermal zone, that with less than 200 degree-months (Ibid., p. 9). He also showed that in the USSR the best conditions were in the West (West Ukraine being the very best) and the worst conditions were in fact in parts of Russia. According to Field’s thermal (degree-months) and moisture (percentage of potential evapotranspiration) ratings, Moscow is equivalent to Sault Ste. Marie, MI; and Rostov-Don, in the premier agricultural region of Russia, to Pierre, SD. Both American locations are relatively marginal in American agrarian ecumene (Ibid., p. 8).

Why wasn’t Field’s well-documented analysis consulted by Sovietologists? For those who did not live in the West it is difficult to second-guess.² But a not-so-tacit agreement came to dominate the agrarian sub-field of Sovietology wherein references to nature are just considered excuses. Interestingly, the same view dominated the stand taken by the analysts and liberal reformers in the USSR itself.

After the collapse of communism, the environmental constraints of Russian farming became a topic popular with Russian writers who began to revisit the 19th century classics. The most discernible of today’s voices is that of Leonid Milov (1998). Among other things, he draws upon the fact that in Europe, with the exception of its extreme north, winter isotherms trend north-south (Milov 1998, p. 8), so Kursk (52 degrees northern latitude), in the middle of Russia’s Chernozem belt, is colder in winter than Helsinki, Finland (61 degrees). Milov pays special attention to the annual duration of cattle being kept stalled (seven months) as undermining the productivity of animal husbandry. He believes that Russia’s historical penchant for subjecting an over-abundant land base to cultivation is in fact the flip side of the inadequate quality of land in Russia’s heartland (Ibid., p. 22). According to Milov, Russia is the archetypal society with environmentally conditioned minimum surplus value per unit of land, which historically has brought about specific forms of socio-political organization (such as rural commune) and governance (despotism).

The nature of Milov’s reasoning that establishes a causal link between despotism and harsh natural environment may justifiably place him in a cohort with the most unabashed environmental determinists of the past. One reason why a paradigm “largely ridiculed out of mainstream [American] geography by the 1920s” (Beck 1985, p. 1) is held in high regard in

today's Russia is that removing old taboos is oftentimes considered a virtue in and of itself. Under the Soviets a deterministic paradigm was neither defeated in substantive debates, nor even sidelined in the name of political correctness. Rather, the excoriation of determinism "became officially canonized as part of Stalinist dogma" (Bassin 1992, p. 4). So, today, according to the principle of reactive perception, it is regarded by some as a new and fashionable orthodoxy,³ with all pretenses of a normative theory.

However, despite the overtly ideological biases of Milov's approach, we think that its premises cannot be discarded. We share Bassin's view, according to which "environmentalism per se [does] not possess an inherent ideological bias" (Ibid., p.5) that leads in a preconceived direction, whether it is the enslavement of non-Western civilizations or the justification of Russia's economic self isolation from the rest of the world (as per Parshev 2000) or, for that matter, Russia's life-long affair with despotism. What is more, the opposite approach -- that is, a tacit denial of the environment's essential role in agriculture and socio-economic development in general -- would be a mistake of similar, if not greater proportion.

Our task will be to conduct a regionalization of European Russia's agricultural land base using thermal and moisture zone classes somewhat more detailed than those applied by N. C. Field, but following the general logic of his analysis. Field's information base on temperature and moisture distribution in the USSR was fairly limited and generalized. Much more detailed classifications of the Soviet agricultural land resource became available in the 1970s and 80s (*Prirodno-* 1975, 1983). These classifications involved many more indicators than Field's analysis (e.g., temperature extremes, the degree of continentality, snow cover, soil type, net primary productivity, etc.) and are more spatially detailed and involve a taxonomy of biomes and their component ecosystems. Our task will be to substantiate the numerical thresholds of natural characteristics outside of which certain zones of agricultural land (cropland in particular) can be regarded as marginal. We will accomplish this using Russian data and both Russian and Western ideas about such thresholds. [Because sundry casual and more rigorous assessments of marginality are routinely done with Western reference points in mind (even and, perhaps in particular, when done by Russians themselves and for domestic consumption), Western ideas of what constitutes marginal lands are especially important in this regard.] An excellent review of marginal lands literature is provided in Beck (1985). A resultant map will show agricultural land in Russia that, according to West European and North American beliefs, is considered marginal.

Burden of Space

Russia is a country with vast inter-urban spaces. Under Russian conditions only large cities (in most cases over 250,000 residents) have had what Russians call *raionoobrazyushcheye znachenije*, that is, the power of true spatial integrators that cast a web of social contacts onto the surrounding area transforming it into a nodal region containing a community with strong regional identity (Rodoman 1999, pp. 108-131). In European Russia, average distance between cities with at least 250,000 inhabitants is twice as large as in West Europe (Ioffe, Nefedova., 1997, p. 27). Russians, in addition, have never had a quality network of roads and other communication systems with their far-flung and dispersed settlements even within existing nodal regions. Because of this, even the most densely packed swaths of European Russia have never entered the spatial deconcentration era as defined by Western scholars (e.g., Fielding 1990; Geyer and Kontuly 1992, etc.) despite brief but misleading symptoms of its commencement in the early 1990s [Ioffe et al, 2001(d)]. The sense of remoteness and isolation, poignantly captured in the poetic Russian diminutive *glubinka*⁴ continues to drive people out of the outlying rural areas.

Throughout several post-war decades, peri-urban (but rural in their status) areas fared the best (Ioffe and Nefedova 1998, 2000). These areas could benefit from spillover effects of urban investment and from the heightened density of linear infrastructure converging on any city, like radial spokes converging on a hub.

In contrast, the rural periphery, located outside a two-hour accessibility range from urban centers, was inflicted by prolonged social decay. In the mid-1980s, it was estimated that in such areas agricultural output had negative elasticity with respect to land. In other words, more land under cultivation actually meant less production, not the other way around (Ioffe 1990, pp. 50-51). Marginal productivity of any production factor or input becoming negative is indicative of this input's relative **redundancy**. Indeed, working the land in some Russian regions has been not unlike biting off more than one can chew.

Massive abandonment of land then hardly comes as a surprise. Invariably, the scale of land abandonment in the periphery vastly exceeded the reduction of peri-urban farmland as a result of urban sprawl. Land abandonment has been especially rampant in the Non-Black Earth regions [Ioffe, Nefedova 2001(b)], but it has not been confined to them. For example, in Penza Oblast, lying on one of the world's best Chernozem soils, 500,000 hectares (25% of the oblast's total agricultural land) has been idle for five years (Shvedova 2000).

One should point out that center-periphery gradients in the intensity of agricultural land use (from reasonably high yields to land abandonment) in Russian regions have to be considered against the backdrop of fairly low *average* productivity of land. Earlier we calculated that the yields' ratio between West Europe and the European part of Russia was relatively stable, fluctuating for roughly 100 years (1880s – 1980s) only between 2.5 and 3.8. Livestock density comparisons, beginning with data collected long before the advent of communism show an even more striking stability [Ioffe 1991(a), p. 334]. This brings grist to the mill of Milov's premise that Russia is a country with an environmentally conditioned low surplus value per unit of land. This premise, however, could be invalidated if land under cultivation was prudently limited, especially if this was done not in a *fait accompli* fashion, but on the basis of the advance knowledge of the inherent futility of subjecting excessive land to cultivation.

In this regard, our goal is to come up with an assessment of the degree of land redundancy in Russian regions. Unfortunately there is no single measure to apply, and qualitative/expert judgment is unavoidable. The following observations will inform region-specific expert judgments:

- a) actual statistics of land abandonment,
- b) output elasticity with respect to land size (derived from econometric cross-section, raion-disaggregated Cobb-Douglas production functions or, in other words, regression models with Y being gross agricultural or crop farming output, X_s being land, labor, and fixed assets, and information units being raions of a single oblast),
- c) popular indices of spatial concentration (Gini index, coefficient of geographical association, etc.),
- d) space and aerial imagery,
- e) agricultural employment per unit of land, and
- f) selective reports of Moscow-based and provincial Russian newspapers.

We recognize that each of these ways of measuring agricultural land redundancy has some disadvantages. For example, (a) reflects the process with a significant lag, in some cases as long as ten years or more; (b), (c), and (e) have to be adjusted to varying agricultural specializations; statistical problems may arise as a result of the incorporation of land in production functions (b); and (d) and (f) are only spottily available. The design of a relevant evaluation algorithm of land redundancy is integral to our research. What seems to be the best direction is to analyze combinations of all the available data juxtaposed on a map. This will require GIS. The logic of the corresponding procedures is described below (p. 6), in conjunction with the following level of analysis, the juxtaposition of *several* development constraints (land redundancy being just one of them.) At this stage, our goal is to produce veritable estimates of the degree of redundancy in agricultural land on the basis of all available data and subject to certain qualifications and thresholds. Regions with high estimates of redundancy will then be subjected to more detailed scrutiny.

Demographics and human capital

The rural population of Russia had been declining from the mid-1930s to 1990. During that period it shrank from 76 million (1926) to 39 million (1990) people. From 1991-1995, it grew, but since 1995, it has again been declining. This picture conceals crucial changes in the interplay of the two major components of change -- natural increase and migration (Ioffe and Nefedova 1997, Chapter 5; Wegren et al., 1998). Rural depopulation has been exceedingly spatially uneven. In the 1970s and '80's -- when births still outnumbered deaths in the countryside, but rural exodus was in full swing and rural population numbers shrank in every oblast, many peri-urban areas (but rural in their status) recorded population growth. Contrary to what might be expected, the agricultural contingent of peri-urban population was the fastest growing (Ioffe 1990, p. 90-91). These areas also enjoyed a higher quality of agricultural labor. The disruptive influence of urbanization on agriculture in the West (Bryant and Johnson 1992, pp. 25-26) hardly fits the Russian context. Agriculture has in fact benefited from urbanization in most, if not all, Russian regions.

In contrast, sweeping depopulation has affected the outlying segments of the countryside, located outside 2-hour isochrones to oblast centers, especially in the Non-Chernozem Zone. For example, in the province of Great Novgorod (21,000 square miles), where the 1998 rural population size was one half that of 1959, in areas outside the 2-hour isochrone it is in fact but one sixth the size. Such remote areas account for about 40% of the oblast's total land area. This sharp polarization imposes a powerful demographic constraint on agricultural development. Two major variables inform this constraint, the percentage of retirees and amount of agricultural land per available worker.

In this project we intend to delimit areas most subject to demographic constraint. We will pay special attention to areas lying outside the 2-hour isochrones around provincial centers because in previous research this spatio-temporal limit was shown as crucial for depopulation in Russia (Lola, Savina 1978, Ioffe 1990). The Atlas of 193 Soviet urban agglomerations will be helpful because it delimited agglomerations according to the 2-hour accessibility (*Atlas* 1984; Zaslavsky et al 1990). We will juxtapose the two above-mentioned (and possibly other) variables through GIS and establish empirical thresholds of depopulation based on demand induced by normative labor intensity within the prevalent agricultural specialization of the area.

We will also test the hypothesis about the spatial realignment of rural population. According to this hypothesis, in societies that are not transplanted but autochthonous, that is, sprung from land, rural population density historically correlated with fertility of the soil. However, with the passage of time the significance of soil quality as a chief predictor of rural population's density declines, while another factor, accessibility to urban centers, gains in significance. We will test this hypothesis by applying path analysis (Namboodiri et al. 1975; Babbie 1995), a version of regression model, to rural population density (the outcome or endogenous variable) versus soil fertility estimate and the potential of urban population (predictors or exogenous variables). We will apply path analysis to several successive points in time (late 50s, late 70s, and 2000) to assess changes in the percentage of rural population density's spatial variance attributed to each of the two predictors. We will also view the outcomes of this analysis through the looking glass of contemporary processes in Latin America and China as well as processes that unfolded in West Europe prior to the advent of the spatial de-concentration era in the mid-60s to early 70s.

We realize that at least one important issue of those subsumed by the "demographic constraint" is missing from our analysis so far. This is the quality aspect of the said constraint or, in other words, the quality of human capital.⁵ Although we do not know at the moment how to objectively incorporate this reality in our formal analytical framework, we will definitely share our observations in anecdotal form. Considering how neglected and sensitive the subject in

question is, this narrative as well as the very acknowledgment of the issue will be an achievement of sorts.

Juxtaposition of three constraints to agricultural development

The three kinds of constraints (environmental, spatial, and demographic) to which Russian agriculture is subjected are inter-related. One can say that they emphasize different aspects of the composite development constraint that we would like to evaluate. To accomplish this we will juxtapose these three constraints on a multi-layered map. Two issues require attention in this regard. First is the technique of juxtaposition and second is the choice of a basic spatial information unit.

Our chosen juxtaposition technique involves three interrelated goals:

(a) Organizing available data into a GIS so that the information collected in the project can be easily manipulated, interfaced with analytical and cartographic software, and integrated with spatial and statistical data yet to become available. Detailed metadata documentation and lineage description of the information layers will be an essential part of this system. A necessary condition for the database is "longevity", i.e., making it usable beyond the scope of this project and by other researchers;

(b) Using the assembled database to develop data matrices and geographic layers for statistical and cartographic analysis. We are planning to aggregate available statistical data by groups of administrative raions (see below), an adequately detailed spatial unit. Specifically, the data on soil quality, land redundancy, and rural demographics will be arranged in geographic matrices and aggregated using GIS overlay techniques.

(c) Delineating and analyzing several key areas at larger scale. Since auxiliary information in the form of media reports and ad hoc statistical estimates is available for a limited set of raions within the study area, these areas will become the focus of a more detailed study of the relationships between land abandonment and other social, economic and environmental characteristics.

Combining multi-scale spatial data across domains for statistical analysis and multi-criteria evaluation has been a recognized research problem for a number of years, with solutions ranging from "gestalt" approaches to various mathematical models of data integration [for example, Hobbs (1985), Carver (1991), Hobbs et al. (1992), Walsh (1993), Hobbs and Meier (1994), Jankowski (1995)]. To develop a map integrating environmental, social-demographic and location and space-related constraints, we will use a "factor combination" technique [as described in Hopkins (1977), Chrisman (1997)]. This technique involves overlaying all pertinent factors and then interpreting and rating their combinations. Avoiding linear combination of individual constraint values, this approach takes into account interrelationships between factors. While relatively time-consuming, it provides the most appropriate integration technique since it allows transparent incorporation of auxiliary data into formal research design. Similarly, our statistical modeling of development constraints will be based on pair-wise analysis of relationships between variables in an attempt to find factor aggregations that provide for "best" (most accurate) explanations of particular threshold levels of these constraints and imminent or advisable land abandonment. The choice of this approach [i.e., development of explanatory rules based on union (logical OR) or intersection (logical AND) of individual constraints] is justified by the presence of numerical, ordinal, and nominal data in our study. Ordinal data is probably unavoidable in conjunction with land redundancy constraint (see above), while nominal data may serve to reflect some environmental aspects (like soil type).

As far as the primary spatial unit of analysis is concerned, we intend to use L-regions, that is, groups of adjacent raions, a pattern of regionalization designed by Yevgeny Leizerovich in the late 1980s for the sake of physical planning (*Rekomendatsii* 1988). This pattern divides each Russian oblast or republic into 2-5 blocks of neighboring raions with a similar meso-geographic location. This grouping involves a logic similar to that instrumental in grouping counties into

consolidated SMAs in the US. L-regions offer a compromise between 68 oblasts/republics of European Russia (arguably too aggregated, vast, and internally diverse information units) and approximately 1000 county-like raions (the level of spatial resolution too labor-intensive for our project team and therefore impractical.) We believe that the biome taxonomic units will lend themselves easier to aggregation in L-regions. We will still use raion-based population and agricultural land statistics to group raions into L-regions. We envision that the overall accuracy of our estimates will be greater for L-regions than for a set of individual raions.

Predictors of spatial variance (Step 2)

The actual scale of agricultural land redundancy in Russia is unknown to us at the moment. Yet we anticipate that should the objective constraints discussed above be recognized so this redundancy is effectively eliminated, Russia will still be in possession of vast agricultural space, more than adequate to meet domestic demand for food and with variable conditions for modern farming. We distinguish three major predictors of spatial variance: soil quality, urbanization, and degree of market conversion.

Two out of three mentioned predictors of variance have long been conceptualized by the notion of *economic rent* viewed as a relative measure of the advantage, or surplus productivity, that one parcel of land exhibits over another. This will be measured in monetary (gross agricultural output) terms and in kind (e.g., grain yields). Such surplus productivity can be gained due to favorable natural conditions and/or due to differential accessibility to urban cores. The former can be labeled Ricardo's rent and the latter Von Thunen's rent, reflecting the names of scholars who conceptualized the respective varieties of economic rent and pioneered their application in agriculture (Berry et al, 1997, pp. 202-209). Accessibility to urban cores no longer underlies differential productivity of farming systems in the West, but it still does in Russia. Two out of the three spatial constraints outlined in the first part of this proposal, environment and burden of space, are in line with Ricardo and Von Thunen specifications of economic rent.

When normative land tax -- a composite measure of land utility -- was assigned to each Russian region in 1995, this seemingly arbitrary land value appeared to be a function of Ricardo and Thunen specifications of economic rent as measured by bio-climatic potential⁶ and urban population density [Ioffe and Nefedova 2002]. This result attests to the validity of these two predictors of agricultural variance in today's Russia.

The formal logic of this analysis (predictors—variance—outcomes) now leads us to outcomes or the ways in which agricultural variance reveals itself. Theoretically speaking, there are two such outcomes, specialization and land use intensity. As was shown earlier, in Russia differences in specialization are not as profound as the amount of spatial variance might imply (Ioffe and Nefedova 1997, Chapter 4). As for differences in land use intensity, they formed a rather predictable meridional-zonal character within the European section of the former Soviet Union (FSU) (Ioffe et al. 1989⁷) because by and large both the favorability of climate and urban influences increase as one goes West. It can be shown that the state investment strategy derived its preferences from this while not acknowledging it publicly: fixed assets and fertilizer use per hectare had a pronounced east-west gradient in the European USSR. However, when one switches from the European section of the FSU to European Russia by itself, this pattern breaks down as some of the least successful agricultural regions (like Pskov, Novgorod, and Smolensk) are located in Western Russia.

In order to explain the Russian pattern, we will test the hypothesis that the difference between actual and normative (i.e., prescribed by the bio-climatic potential) **grain yields** is the function of the socio-spatial environment, including such variables as inter-urban distances and rural depopulation. Regression analysis will be used. We will also attempt to explore and assess the relative performance of natural and social components of differential/economic rent in

agriculture. This amounts to posing the question, has productivity been getting more dependent on one than the other of these components? Alternatively, with the passage of time, which areas become better suited for successful farming, Russian-style, the most urbanized *or* the best endowed naturally? Because polarization of the countryside has proceeded unobstructed for decades and that could not help but deepen attendant core-periphery gradients, we hypothesize that for agricultural output closeness to an urban environment should be gaining in significance compared to natural fertility of the soil, which is not subject to short-term changes [Ioffe 1990(a)]. We will test this hypothesis by regression analysis. Cross-section specifications of regression models (i.e., those based on geographical matrices, not time series) will be calibrated for different points in time using the above-mentioned variables, grain yields (alternatively: monetary output per unit of land), bio-climatic potential, and a proxy for urban influences.

So far we have invoked only two aspects of agricultural variance in European Russia. The third one, market conversion, is intimately related to current reform. At first glance agrarian reform has indiscriminately targeted all of Russian regions and thus can be thought of as an aspatial and exogenous factor of agrarian development, not unlike collectivization of the 1930s. Both reforms were conducted in a top-down fashion. Regional responses to current reform, however, have been anything but identical. In this regard, our preliminary analysis resulted in three important observations.

First, regions advancing during the 1990s in the ranking of Russia's major agricultural producers included both reform-resistant and reform-prone regions, and the same holds true with respect to regions falling in the ranking over this period. Second, upward trends have been more pronounced in the most urbanized regions, whereas the agriculturally best endowed regions typically have experienced pronounced setbacks. Third, better-endowed regions continue to demonstrate a more interventionist, neo-Soviet style of agrarian management, while less well endowed regions by and large have adopted a more *laissez faire* approach (Ioffe and Nefedova 2000).

The last conclusion was tentative and preliminary because it was not based on actual measurement of market conversion. In this regard we rather followed media accounts and the personal views of regional bosses. These, however, are not overly firm foundations from which to proceed, and so in this project we intend to measure market conversion explicitly. The most probable indicators of market conversion at the regional level are the a) ratio of out-of-farmgate sales to output, b) ratio of current liabilities to sales (high liabilities potentially tie farms to local and federal budgetary supports), c) share of subsidiary farming output as compared with the corresponding share in the economic macro-region (theoretically, a high share of subsidiary farms reflects self-supply or so-called natural economy, at the expense of market. However, a higher share of subsidiary farms in the gross agricultural output may also reflect mainstream regional specialization; e.g., the share of subsidiary farms in the output may be low because staples like grain cannot be consigned to rural residences' backyards, a reason unrelated to market conversion); d) share of direct commodity credit by local administrations in the overall liabilities (a high share is yet another indicator of farms being kept on a short administrative leash), and e) ratio of production costs to sales as compared with that of the economic macro-region as a whole), etc. The scope of indicators still needs to be finalized and fine-tuned. We intend to measure market conversion *per se* taking special precautions not to confuse it with favorable trends in output that do not necessarily derive from market conversion.

Core-Periphery Land Use Intensity Contrasts (Step 3)

Concentric zones of outwardly declining agricultural land use intensity have been repeatedly documented around Russian cities [Viltsyn 1974, Ioffe 1984, Ioffe 1988, Zhikharevich 1989,



Figure 1. 1997-98 Gross Agricultural Output in Thousands Rubles per Hectare of Agricultural Land in Moscow Oblast (shaded area is the city of Moscow). Source: Ioffe and Nefedova 2000 (b).

Ioffe 1991, Ioffe and Nefedova 1997, 2000, 2000(b), 2001 (a), and 2001 (b)]. To anyone with training in economic geography such concentric rings (Fig. 1) would remind a classic model of agricultural location around the market center. The protracted existence of land use intensity gradients that underlie concentric zones in Russia might seem puzzling. After all, Thunian rings reflect closed local market systems and are believed to have resulted from spontaneous economic decisions that independent farmers made when faced with location rent. However, neither element of this setting (closed local systems, spontaneity, and private farming) has recently typified Russia's agrarian scene, nor do they really exist today. There is a well-established opinion that today, "Thunen effects at the local scale can be observed [only] in the developing world, where localized circulation systems resemble those of early 19th century Europe" (Stutz and de Souza 1998, p. 267). Similar concentric zones, of course, once existed in the West. However, they were eroded by the early-mid-1960s, and Sinclair's seminal work was an analytical response to that (Sinclair 1967). In this regard it is worth emphasizing that the pattern with a very steep core-periphery gradient shown by Figure 1 is a statistically documented fact, a reflection of the objective reality, not by any means the product of our faithful attachment to an outdated theory. Note that the maximum radius of Moscow Oblast is 110 km; within this stretch of a distance agricultural output changes from about 2,000 to more than 20,000 rubles per hectare of farmland, as one approaches the city of Moscow (fig. 1)! Similar patterns (however, with somewhat more gentle gradients) were uncovered and documented for the 1980s and 1970s.

The detailed version of our present interpretation of this pattern can be found in three peer-reviewed publications. One of them was released in Russia (Ioffe and Nefedova 2000 b), and two

others are to be published by September 2001 in Britain (Ioffe and Nefedova 2001a) and the US (Ioffe and Nefedova 2001b). In the nutshell, the continuing existence of concentric rings in Russia is attributed to the fact that rural depopulation has long outpaced the compensatory technology (let alone management) change in Russian agriculture. Because of this, new investment has been subject to diminishing returns. In an environment of technological stagnation, fixed assets (in this case agricultural implements, buildings, etc.) can substitute for labor, but only up to a point. Ioffe (1983) determined critical thresholds of the capital/labor ratio in Russia's agricultural regions (the Soviet equivalent being monetary value of fixed assets per worker). Whenever, as a result of additional investment, this threshold was exceeded, it produced negative returns. In other words, the marginal productivity of capital turned negative. Threshold values were particularly low in outlying areas, outside the 2-hour isochrone to large cities (Ioffe 1983, pp. 84-85), which, as shown above, were subjected to sweeping depopulation.

Because the environs of large cities oftentimes hold the only demographically sustainable rural communities, the agrarian investment strategy exacerbated core-periphery gradients in agricultural land use intensity. Simply put, because most younger people with requisite skills, commitments to their jobs, and long intervals between bouts of binge drinking find themselves in proximity to large cities, little modern investment went beyond such cities' environs. Central planners claimed publicly that their goal was to level the playing field. But what they actually did was create a noticeable concentration of cattle and pig fattening, poultry, and dairy farms in proximity to all large and medium-sized Russian cities. In Moscow Oblast, the core-periphery drop off in head of livestock per unit of land is the most important component of the gradient of agricultural land use intensity documented by Figure 1. Thus measurable differences in fixed assets (capital intensity) underlie concentric rings, although the spatial pattern of rural depopulation remains the root cause, the same cause that was interpreted as the demographic constraint (see above).

What we, therefore, witness in Russia are "*quasi*-Thunen" rings. They are similar in appearance to their classic counterpart but hinge on different factors.

In this project we will pose the question, to what extent do core-periphery land use intensity gradients in Russian agriculture go beyond the call of economic rationality as evidenced in economic rent (wholesale prices minus transportation costs). We will also assess the dynamics of these gradients in several Russian regions, at least since the 1960s, and, to the extent possible, over a longer period. Three hypotheses will be tested in this regard. According to one of them, *quasi*-Thunen rings are more pronounced in less endowed and more depopulated regions. According to the second hypothesis, gradients underlying *quasi*-Thunian rings depend upon the size of the urban center. According to the third hypothesis, market conversion tends to undermine a concentric rings pattern for the same reasons it did so in the West. (This, however, has not yet happened in Russia; moreover, in the 1990s, core-periphery gradients increased at least around Moscow.) Regression analysis and its graphic interpretations will be the primary instruments for testing these hypotheses.

Russian agriculture: spatial contrasts and the potential for revival (Step 4)

If Russian agriculture is destined to survive the current crisis and perhaps even become one of that nation's successful economic activities, it will not happen everywhere at the same time. It will occur more quickly in some areas than others, and in some it may not happen at all. It will definitely occur faster if new realities and on-going processes are recognized by the major economic actors involved. Prospects for Russia's agricultural turnaround must be connected with the above-described characteristics of agriculture's spatial basis and its attendant constraints and spatial variance.

Monitoring the on-going evolution of Russian agriculture for a long time, we have noticed three major processes with the potential to generate favorable trends. These are a) the continuing contraction of land under cultivation (which under current conditions is not unlike pruning trees by cutting off dying and dead branches), b) a rural demographic revival, and c) vertical cooperation and integration of the elements of the food chain, notably farms and food processors. All three processes are highly spatially selective.

Because we focused on land contraction in one of the foregoing steps, it will be our task in concluding this project to focus on the two other revival processes. As far as the demographic revival is concerned, we will need to analyze the potential of the on-going net migration to reverse rural depopulation (whereby deaths outnumber births due to aging rooted in the long-lasting out-migration of the young) and rejuvenate and improve the quality of human capital. We have considerable experience analyzing rural demographic statistics, experience reflected in our publications (Ioffe and Zayonchkovskaya 1987; Ioffe and Nefedova 1997, Chapter 5; Demko, Ioffe, and Zayonchkovskaya 1999). To detect changes in the quality of human capital we will have to rely on indirect evidence (local media, conversations with local bosses, records of education level, etc.) for lack of more accurate sources.

Because of deeply ingrained demographic and human capital constraints, very few bottom-up (i.e., emanating from the farm level) initiatives have led to nationally recognized success stories in Russian agriculture. In contemporary Russia, former collective and state farms remain just about the only framework for cooperative action of a horizontal type, that is, within and among grassroot communities in rural Russia.⁸ However, only about 20% of these are profitable and 40% are deemed irremediable (Novoprudskii 2000). This explains why in Russia only top-down reform initiatives have a reliable record of getting things done and why state patronage is so tenacious even when top echelons of power are no longer ideologically committed to stifling local initiatives. (In fact, they have been committed to this for so long and succeeded so well that local initiatives are no longer in the offing.)

When domestic and foreign-owned food processors in dire need of stable and fresh local supplies conclude contractual agreements, invest in the modernization of equipment and in some cases buy up farms to include them in their corporate structures, these practices constitute top-down strategies as well. However, in contrast to state patronage, these are market driven and as such hold more promise for farms, consumers, and the food chain as a whole.

This is what makes contractual links between food processors and farms so important. Such links reflect vertical cooperation and integration in the food system, i.e., within commodity chains. It follows from numerous empirical observations [summarized in Ioffe and Nefedova 2001(a)] that vertical cooperation is mutually beneficial to all the economic units involved. Privately owned food processors need stable supplies, and nominally privatized communal farms face shortage problems unsolvable within the languishing system of state patronage. Socialized farms own land, but still cannot legally sell it to a non-agricultural user. They lack not only stable channels for selling their produce but also the financial wherewithal to maintain or replace their aging equipment. The latter problem was referred to as one of the principal factors holding back agrarian development by 93% of farm managers surveyed by Goskomstat in 1998 (*Regiony...* 1998, p. 380). Cooperation with financially solvent food processors will be able to resolve this and other problems at a time when government support is minimal.

In this project we will analyze and typify the developing agro-industrial partnership within the food system. We will consider links between farms and food processors through the prism of the notions of agrifood system, commodity chain, food chain (Whatmore 1995), vertical integration (Hart 1992), and agribusiness (Davis & Goldberg 1957). Also a Russian-born concept of APK (agro-industrial complex) will be used, as well as Alexander Chayanov's theory of horizontal and vertical cooperation (Chayanov 1927). These notions will allow us to conceptualize the whole movement of food from farm to table as it proceeds in Russia and to outline the structural proportions pertaining to the identified partnership. We will pay special

attention to success stories, which we define as cases whereby a food processor not only satisfied its demand in fresh supplies, but also contributed to the modernization of a farm. We will also focus on farm size and supply zones of selected food processors emphasizing cases whose significance goes beyond locales and regions.

Case Studies

As mentioned above, the parts of the project devoted to quasi-Thunian rings (step 3) and to agricultural revival and agro-industrial links (step 4) will be accomplished on the basis of oblast-level case studies. We plan to focus on three subdivisions of European Russia that differ from each other significantly in terms of exogenous influences on agriculture. We will specifically concentrate on oblasts within well and not-so-well endowed agricultural regions and also on oblasts that are highly urbanized and those with a low level of urbanization. This is in line with the predictors of Russian agriculture's differential performance pinpointed in our earlier work [Ioffe and Nefedova 2002]. The final selection of case studies is necessarily part of the proposed project simply because the logistics of information gathering in Russia is every bit as important (and sometimes more) as substantive reasoning. Tentatively, we have selected Moscow Oblast, Stavropol Kray, and Kostroma Oblast. To be sure, this choice does not exhaust the available variety of conditions vis-à-vis agriculture. However, a larger number of case studies will probably prove impractical for the in-depth research proposed in the time available.

Succession of work, division of labor, products

This proposal derives from years of pondering over, conceptualizing, and monitoring change in Russian farming. The proposal is broad, but not all-encompassing as it leaves some important issues (e.g., subsidies, farm management, etc.) outside our frame of reference. Variable conditions for farming in Russia is this project's linchpin. If variance or any of its aspect extend beyond a certain threshold, a constraint is imposed upon farming. Even if it does not, it still affects major parameters of farming activity, including land use intensity. Alongside the traditional aspects of agricultural variance encapsulated in the notion of economic rent, a new aspect, market conversion, is at work in today's Russia. Because Russia deals with economic crisis, restructuring, and depopulation at the same time and also sustains a vast agricultural land resource poorly supplied with infrastructure, the burden of space must be added to the list of variables and constraints. Furthermore, prospects for agricultural revival in Russia hinge upon the variables and constraints defined and analyzed in the project.

We plan to focus first on the ideas of development constraints and their juxtaposition and measurement (Step 1) because this is the least explored component of this proposal. We envisage spending proportionally more time on this step because of the previously unexplored ways of formatting spatial information, potential logistical and methodological problems, and the need for extensive data collection. Step 1 will preoccupy us for the entire first one-year period (April 2002 – April 2003). Steps 2, 3, and 4 will be completed during the next 14-month period (May 2003 – July 2004). The period from July 2004 – May 2005 will be devoted to book preparation.

At least three articles will be submitted to academic journals. We plan to discuss preliminary results at the annual meetings of the AAG and AAASS. (The idea of development constraints was presented by Ioffe for the first time during the 2001 AAG convention.) We plan to share our findings in a magazine designed for an educated lay audience and in a multi-disciplinary journal devoted to post-Soviet affairs. Finally, to make the results of our project available to wide audience of researchers and educators, we will develop a Web site with interactive maps of Russian agricultural statistics and constraints, accompanied by multimedia descriptions. The maps will be created using a new XML-based technology for browser-side

vector map rendering developed by Zaslavsky (2000). The Web learning module on Russian agriculture will be made available through the Multimedia Educational Resource for Learning and Online Teaching (MERLOT, at www.merlot.org), a growing collection of online learning materials and reviews. As part of the learning module, we will document and publish the data collected in the course of the project, using an open software-independent XML-based format to enable easy access and online analysis of the data. This design, along with the interactive mapping and analysis interface, will make the methods and outcomes of our research project transparent to researchers and students, for both education and data integration purposes.

While directing the whole project, Grigory Ioffe will bear primary responsibility for the project's design, multivariate statistical analysis, and ensuing publications. Tatyana Nefedova of the Russian Academy of Science will be most deeply involved in data collection, and she will assist in the interpretation of analytical results. Ioffe and Nefedova have successfully collaborated on several projects and co-authored many articles and two books. Ilya Zaslavsky's (with the Ph D from the University of Washington at Seattle) contribution will be in GIS design and application, the interpretation of its results, and in overseeing application of statistical software.

Costs

Major costs are a) salary for Ioffe (2/9 of academic salary) for three successive summers, b) consultant fees for Nefedova, and Zaslavsky for 30-50 days a year, c) two field trips to Russia for Ioffe, including trips to Russian provinces, d) one trip to the USA for Nefedova, e) domestic trips for Ioffe and Zaslavsky to the sites of AAG meetings and to conduct joint research, f) purchase of raion-structured statistical data-books for over 60 regions of European Russia, and g) publication of results (language editing and typesetting).

Significance of the project

The overall significance of this project has six aspects. First and foremost, we challenge traditional aspatial explanations of Russia's agricultural malaise and thus enhance our discipline, Human Geography.

Second, we contribute to bringing area studies back into the spotlight within Geography. Area studies is inappropriately fading into the background at the same time that historians and political scientists are enhancing their regional specializations.

Third, because Russia is much more rural a country than the official statistics would suggest (a point substantiated in Ioffe 2001), we will contribute to Russian area studies by giving more even representation of the different aspects of Russian ecumene, a representation commensurate with their actual significance.

Fourth, our work will contribute to knowledge about transitioning to a market economy. Market-oriented reform in Russia had initially produced what now might be viewed as inflated expectations on the part of Western Russia-watchers. It was anticipated that many domestic economic structures in Russia would soon come to resemble those of advanced market economies. In a major geographic work on transition economies, Adrian Smith and John Pickles argue that "the conventional, neo-liberal view of transition wielded by western multilateral agencies and advisers [in post-communist countries] that transition is a relatively unproblematic implementation of a set of policies...relies on an under-theorized understanding of change in post-communism" (Smith and Pickles 1998, p. 2). While this indeed may be true, the view of transition aptly criticized above also relies on some *over-theorized* (to the point of a hollow abstraction) universalist dogmas such as individual and private are inherently "better" than public and collective and the market works as a cure-all. In today's Russia these notions are discredited.

According to some Western Russia watchers, “capitalism, Russian-style, if it survives long enough to evolve to a stable final form, will be a uniquely Russian amalgam” (Gustafson 1999, p. 9). To us this means that the “breaking news mentality” of the early 90s whereby the Russian scene was viewed through the prism of upheavals and political personalities rather than long-term processes and their historical and geographical antecedents and roots must be cast aside. We will attempt to accomplish precisely this and we expect that our long-term perspective on Russian transition to market will lead to the optimal dose of theorizing.

Fifth, this project will contribute to broadening the scholarly debate on post-communist transition and encourage cross-pollination of ideas.

Last, but not least, this project will establish an example of a replicable framework for presenting both the data and results of our spatial statistical and cartographic analysis. We will fully document the databases assembled in the process of this research and publish them in a software-independent format, queryable across the Internet and useable by other researchers in the field. This design will contribute to the ongoing development of research infrastructure to enable integration of results from diverse area and case studies.

Notes

¹ A comprehensive 1983 volume *The Soviet Rural Economy* (Stuart 1983) is a case in point. Its fifteen chapters give detailed treatment to numerous aspects of Soviet farming, but none invokes natural environment. Earlier and later publications mostly authored by economists, political scientists, and historians are no different in this regard.

² The ideologically charged atmosphere of the Cold War may have overemphasized political economy reasoning at the expense of something as politically neutral and eternal as natural environment. It might be that the stigma of the environmental determinism, “this veritable geographic swearword” (Lewthwaite 1966 as cited in Bassin 1992, p. 3 and Beck 1985, p. 452), was at fault as well. However, the fight with determinism was conducted within geography, while historians and other social scientists, who for the most part contributed to Sovietology, seem to have remained largely unaffected. Richard Pipes’s famous book of 1974 *Russia under the Old Regime*, the samizdat copy of which we read in the late 70s in Soviet Russia, has a very strong environmental streak as conveyed in the book’s opening chapter, “The Environment and its Consequences.”

³ Contemplating the role of harsh environment gave rise to considerable popular literature for the Russian mass market. The point made is that economic liberalism cannot take root in Russia and Russia’s involvement in free trade is self-defeating in view of inherent environmental disadvantages. The best known of these books bears a characteristic title, “Why Russia is not America?” (Parshev 2000).

⁴ In contrast to “boonies” or “boondocks” that is used in derision, *glubinka* (from Russian “glubina” – depth) has a condescendingly affectionate meaning. It captures the impression that an outlying area produces on a large-city dweller. This impression is a mixture of fascination and compassion.

⁵The long-lasting drain on rural and indeed free-standing small town populations has been aggravated by the self-selection of “movers” versus “stayers.” Those most industrious, bright, dexterous, savvy, and least given to heavy drinking tended to leave for the city, while the most passive and resigned tended to stay. As a result, a very distinctive population, not particularly

receptive to innovation and change is left in the countryside, especially in its outlying segments. The reality in question is by no means elusive. But while it strikes one during field trips, it has so far defied any politically correct framework both in Russia and in the West. A couple of relevant observations develop this theme.

During our three week data collection trip in Kasimov raion (Riazan oblast) in the summer of 2000 we could not come across a single adult male -- after 5 p. m. on a week day -- that would not be blind drunk. There are seven collective farms in the raion, six of which have been producing at a loss for years and, indeed, decades. These farms, however, are not just and even so much production units as they are vehicles of collective survival. The Chair of raion administration acknowledged this when he said "we cannot disband them because people will go under as there is nothing but farmland around."

During the summer of 2000, 140 rural villages of Pskov Oblast stayed without electricity for weeks in a row because the locals pulled down wires and sold them as non-ferrous scrap. Russia currently earns 500 million dollars a year from its export. So with foreign trade denationalized, myriad of illicit buyers are dispatched to different localities to recruit illicit sellers. In most cases, however, what is being dismantled by local "volunteers" is not crucial for everyday life support. In Pskov, one of the most depopulated Russian regions, they have apparently crossed that line. According to Governor Mikhailov of Pskov, between April and July 2000, as many as 800 people in his region perished pulling down wires! This is at least twice as many as those killed in combat in Chechnya during the same time (Ivanov 2000). For something like this to happen, one needs a particular social environment. We tend to think that events like those in Pskov (and they are by no means unique) overshadow much of the ongoing debate over the fate of agrarian reform in Russia, which focuses on the obstacles to reform of a political, legal, managerial, ownership, and fiscal nature. The quality of human capital available for commercial farming, while itself not entirely independent of externally imposed conditions, at any given point in time has the potential to thwart any reform initiative whatsoever.

⁶ A technique for assessing the favorability of natural conditions for agriculture long in use in Russia is based upon long-term records of yields on specially designated, regionally representative parcels of land not using irrigation or any other sophisticated cultivation method. That production occurs under natural conditions of soil type, heat, and moisture. The estimates of the so-called bio-climatic potential thus obtained are expressed in environmentally prescribed average yields of respective crops. The highest grains-related estimates are those of the western North Caucasus and of the western margin of the Central Chernozem. The favorability estimate is fairly high also in the middle belt from the province of Smolensk in the west to Bashkortostan in the east. The European North and the southern part of the Volga region fare the worst in European Russia. Available maps show that in European Russia internally homogenous and continuous belts trend northwest/southeast (Ioffe, Nefedova, and Runova 1989) and more or less ideally match the spatial layout of biomes or natural vegetation regions. The best source of favorability estimates known to us is *Prirodno-* (1983).

⁷ Our map was included by Denis Shaw in his most recent textbook on Russia (Shaw 1999, p. 175).

⁸ The fact that over half of Russia's total agricultural output is currently produced by subsidiary farms, that is, in rural and small town residences' backyards, does not undermine this assertion because the majority of smallholders cannot exist without large socialized farms with which they are in symbiotic relationship. Also, the official record of subsidiary farm productivity may be based on deliberately inflated estimates (in order to shield what is actually produced in collective enterprises from taxation) [Ioffe and Nefedova 2001 (a)].