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Risk in Agriculture as Impediment to Rural Lending – Theoretical Explanation and Programming Model for the Case of Northwest-Kazakstan

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Abstract
On the basis of the portfolio selection theory, this paper finds that whole-farm risk must be regarded as a major reason for the low level of credit flow to agriculture in Northwest-Kazakstan. A linear MOTAD model was used in order (a) to demonstrate the comparatively high overall risk exposition of a typical farm, (b) to show that an inflow of working capital could contribute to risk reduction, and (c) to illustrate short-term risk management strategies. Although there may be a role for the government in reducing risk exposition of agriculture in its current form, natural and economic constraints suggest to pave the way for structural reforms that reduce the importance of agriculture in the rural economy.

Keywords: Agricultural credit; Kazakstan; Portfolio selection theory; Risk programming.

Introduction

The “access-to-credit problem” is a stylised fact with regard to the restructuring and modernisation of farm enterprises in the Former Soviet Union (FSU). It has repeatedly been reported in the literature that agricultural producers cannot attract external funds in order to improve their economic stance, which has recently been explained by low profitability of farms (Pederson et al., 1998; Petrick, 1999b), insufficient institutional solutions to problems of asymmetric information and transaction costs (Swinnen and Gow, 1999), or lack of managerial capacity and willingness of banks to become engaged in agriculture (Heidhues and Schrieder, 1998). This paper seeks to establish an additional reason for little credit funding of farm enterprises in transition, which seems to be often overlooked by analysts and advisors. It is argued that both agricultural policy during Soviet times with its one-sided, output oriented emphasis on extending crop areas even in regions less favourable for crop production, and market frictions due to a hesitant transition towards a market economy after the Soviet collapse result in a heavy risk burden for agricultural producers in the FSU. Since market instruments for risk management are often not available, this risk is regarded as an important obstacle to a more significant engagement of banks in agriculture.

Furthermore, this risk exposition makes on-farm risk management a task of major concern for farm managers. However, it is hypothesised that risk management may be severely hampered by liquidity constraints. Due to high risk, only small amounts of credit may be available for farms at initial stages, and farm managers have to make the best out of what is possible in the given limitations of available technology and farm equipment.

The aim of this paper is to analyse the complex interrelationship of risk exposition and credit supply both theoretically and empirically, and to draw conclusions concerning short-term risk reducing measures for farms. As will be shown, the portfolio selection theory provides a well-fitting framework for dealing with these issues. Corresponding to this, a programming model will be used to yield empirical results.

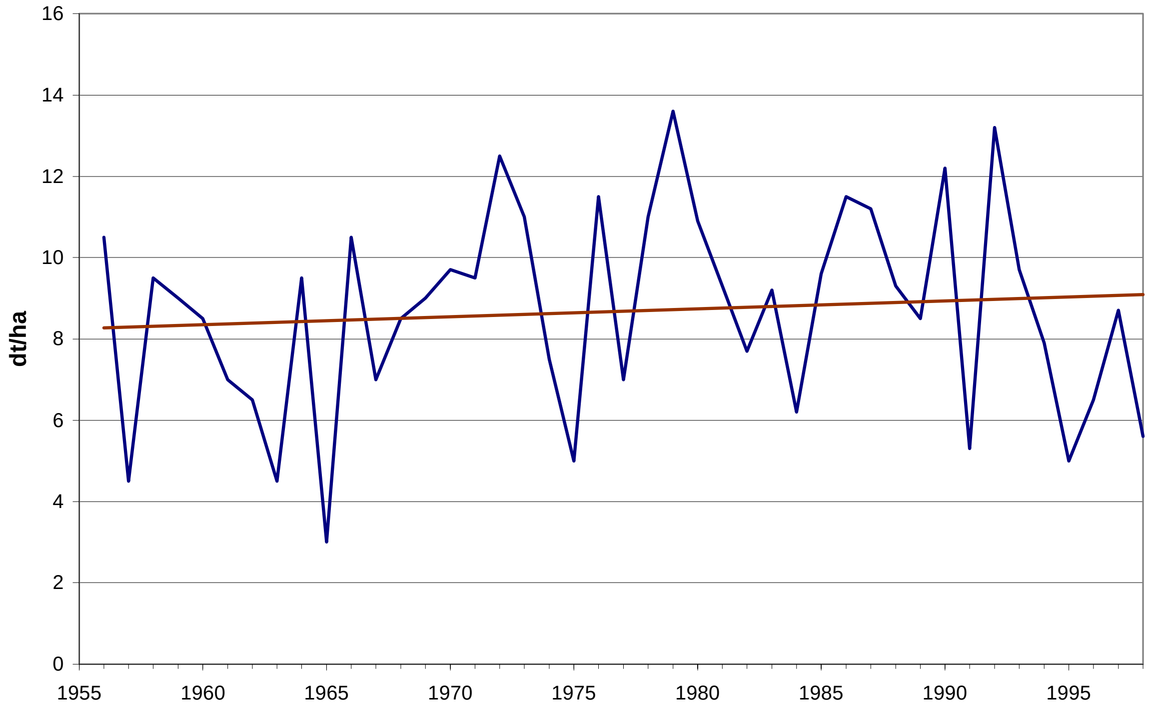
Northwest-Kazakstan with its unique history of crop area extension and its particularly critical natural conditions for crop production can be regarded as a precedent with respect to these issues. As the author could draw on data collected in this region, it will be used as empirical background for the further analysis.

The paper is organised as follows: Section 2 outlines the background of agricultural production in Northwest-Kazakstan and briefly describes the main sources of risk. Section 3 sets the theoretical framework for further reasoning. Section 4 presents the programming approach used to model risk in agriculture, and Section 5 contains the model results. Section 6 concludes with some policy implications.

History of grain area expansion in Kazakstan and sources of risk

In 1954, as a consequence of growing dependence on imported grain and unstable yields in existing grain producing regions, N. Khrushchev ordered a vast expansion of Soviet cropland by ploughing up the virgin and idle lands located beyond the lower Volga and north Caucasus and extending into eastern Siberia (Wein, 1980; Zoerb, 1965). Although a number of large-scale regional development programmes have been implemented during the Soviet era (Rostankowski, 1979; Stadelbauer, 1996), this "Virgin Lands Campaign" must be regarded as historically unique. 492 Sovkhozes were established until 1963, encompassing around 19 mln ha newly developed crop area; the average Sovkhoze covered 25,000 to 30,000 ha of mostly grain area. Thus, in a nine year period, new cropland larger than that of Germany was created. Although formally privatised, many of these "Grain Factories" principally still exist today, most of them situated in the Northwest of the now independent Republic of Kazakstan.
From today's perspective, Soviet expectations concerning a reliable increase of national grain supply as a result of the Virgin Lands Campaign were far too great. According to its geographic and climatic location, Northwest-Kazakstan suffers from highly variable plant growing conditions due to the permanent risk of drought and both late and early frost (Buller, 1985). Since adequate production technologies in order to mitigate the averse impact on plant production were not available or not practised, annual yields per ha up to now varied greatly, imposing a substantial risk burden on agricultural producers (Figure 1).

Figure 1: Grain yields Kazakstan 1955-1998



Source: Rostankowski (1979), Narodnoye khozaystvo Kazakstana var. issues

Furthermore, the trend shows that average yield per ha did not increase significantly during the whole period 1955-1998, which implies that technical progress in plant production has been very modest.

Since national independence, Kazakstan gradually has shifted towards a market economy. This process has a significant impact on the importance of risk for agricultural producers: While risks were mostly borne by the state during Soviet times, nowadays farm managers have to cope with the task of risk management themselves in order to keep their enterprises operating. Recently, agricultural markets have been widely liberalised, agricultural enterprises have been privatised and bankruptcy laws have been adopted (Csaki and Nash, 1998). Hard budget constraints, a lack of working machinery, and scarce working capital resulted in even less favourable conditions for crop production compared to earlier years. Yield risk continues to exist or even increases due to suboptimal production practices. National markets for agricultural products, though liberalised, are highly disintegrated, which can be seen in a low level of price correlation between regional markets for major crops. At least, due to the low integration of markets, demand may be rather inelastic, resulting in a price compensation for variations in supplied quantity. Wheat prices follow world market prices only with a significant deduction, and distribution channels are highly uncertain. As a result, farm managers face a significant price and marketing risk.

Yield-, price-, and marketing-risk currently accumulate to a complex overall risk exposition in Kazak agriculture. However, risk reducing measures may involve substantial capital investment, e.g. improvement of technical equipment and transport facilities, or restoring and extending the irrigation network. Creditworthiness is thus likely to play a major role in opening development perspectives for farms. Still, it can be assumed that lending decisions made by banks are substantially affected by the perceived risks of the borrower. This will be further investigated in the following sections.

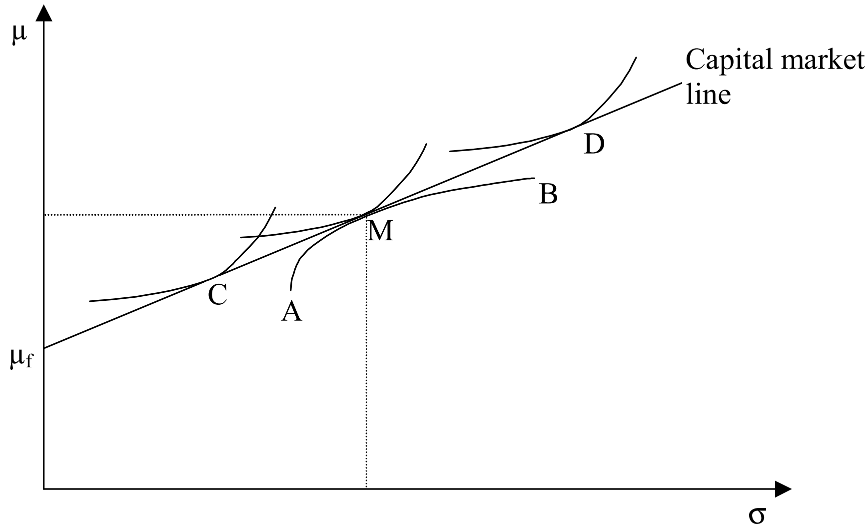
Theoretical implications of portfolio selection for rural banking and risk management in agriculture

The theory of portfolio selection as introduced by Markowitz (1952) attempts (a) to understand how investors' engagement in a specific portfolio of risky assets can be explained, and (b) to recommend on how risk diversification of a portfolio can be pursued rationally (Perridon and Steiner, 1997, p. 249). It has thus both positive and normative implications, which both will be of relevance for the issues dealt with in this paper. The positive aspect concerns an explanation of low credit supply to risky agriculture, while the normative aspect is relevant for the derivation of risk management strategies, as will be shown in the following.

Considering first the positive implications, the behaviour of investors may be conceptualised as a decision of selecting an optimal portfolio of assets with uncertain returns. This problem can be operationalised by assuming that investors' preferences depend only on the first two moments μ and σ (mean and standard deviation) of the random return of their portfolio. This is justified under the assumption that investors have quadratic Von Neumann/Morgenstern preferences, or else that stochastic distributions of returns belong to a particular parameterised family (elliptical random variables; Freixas and Rochet, 1997). If the investor is risk-averse, the theory of portfolio selection claims that all potential portfolios (i.e. combinations of risky assets) can be found on an efficiency line in the form of half a branch of a parable (Perridon and Steiner, 1997, p. 250).

This can be used to analyse the lending behaviour of a risk-averse bank (Neuberger, 1994, pp. 15-28). Risk-aversion of the bank can be justified if there is a probability that banks can go bankrupt and if this bankruptcy causes costs. Both is applicable for the case of Kazakstan. It is further assumed that, alternatively to the risky portfolio, the bank has the option to invest in riskless government bonds of return μ_f. Additionally, the bank can borrow capital from the central bank at the same rate μ_f. Then the problem can be depicted graphically as in Figure 2.

Figure 2: Portfolio selection with fixed-interest bonds

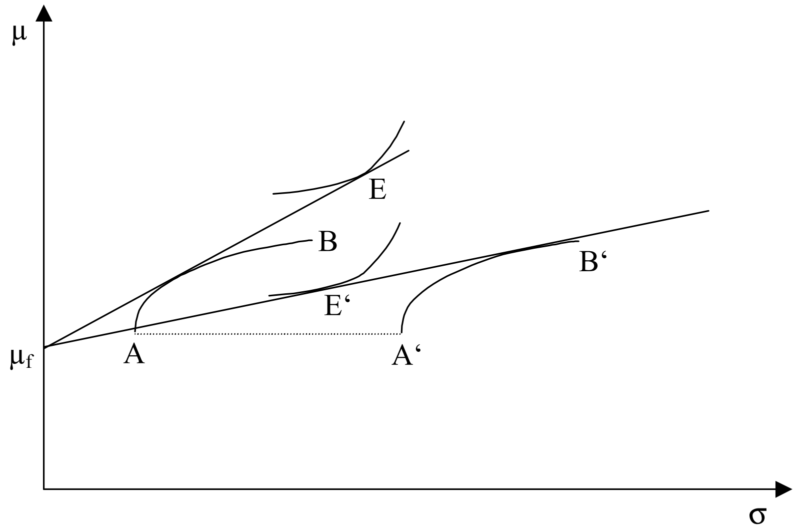


Source: Brandes and Odening (1992), p. 229, modified

The bank chooses to invest in the given portfolio of risky assets represented by its μσ-curve AB, or in bonds with a return μ_f. All efficient combinations can be found on the so called capital market line starting in μ_f and touching M. The tangential point of the respective indifference curve and the capital market line indicates the optimal combination for a given degree of risk-aversion. Differences in risk-aversion have the following consequences: A point on the left of M means that the bank invests only part of its capital in the risky portfolio, while the remainder is invested in bonds (C). Vice versa, a point right of M indicates that the bank is willing to borrow additional capital from the central bank that can be invested in the risky portfolio (D). Only if the indifference curve touches the capital market line in exactly point M, the bank solely invests in the risky portfolio. Notice that point M at the same time represents the one selection of the portfolio AB that is optimal for the bank.
It is now straightforward to investigate how differences in the riskiness of portfolios affect the lending decision of banks (Figure 3).
Consider first the portfolio AB. According to the indifference curve, the bank even borrows from the central bank in order to invest in the portfolio (E). The latter is now shifted to the right (A'B'), which means the same return but increased risk. The new optimum is found in point E', implying a strong reduction of investment in the portfolio, and buying of government bonds instead. As a result, the amount of credit granted by the bank is inversely correlated with the risk of the portfolio.
This can be applied to rural financial markets as follows. First, it is assumed that risky assets are limited to a range of alternative agricultural production activities, e.g. different types of crops. Accordingly, a portfolio of production activities may be represented by an agricultural enterprise (i.e. a farm). It may be realistically depicted by the μσ-curves of either AB or A'B' in.

The figure shows that the extent of credit supply to agriculture depends on the return-risk trade-off in the respective enterprise (i.e. its risk profile). For a risk-averse bank, the volume of credit granted is c.p. negatively correlated with risk in agriculture.

Figure 3: Portfolio selection – different risk profiles



Source: Neuberger (1994), p. 23, modified.

In summary, the amount of credit granted to agriculture is c.p. the larger, (a) the less risk-averse the bank, (b) the lower the fixed interest rate μ_f, (c) the higher the expected return on investment, and (d) the smaller risk in agriculture.
The previous considerations establish a link to the normative implications of the portfolio selection theory. With regard to farm management decision making, the μσ-curve of an enterprise can be used to theoretically determine an “optimal” degree of indebtedness in agriculture (Odening, 1991). Furthermore, the μσ-curve not only illustrates the farm’s risk exposition, but also depicts the set of production programmes which yield maximum return for a corresponding extent of risk (Hazell and Norton, 1986, pp. 79-81). It thus shows the impact of risk-aversion on optimal farm organisation. In quantitative farm models, the μσ-curve can be used to derive risk management strategies for agricultural enterprises by means of diversification. Since for the bank exactly one farm organisation is optimal, this approach can principally result in recommendations on how to organise the farm in order to attract bank credit. However, as will be shown below, the practical value of this concept is limited.
Before discussing the quantitative application, some further critical remarks are in order. Notice that the presented theory assumes a constant return on investment not depending on the total amount, which is of course unrealistic when dealing with an entire agricultural enterprise. The theory neither allows for economies of size and indivisibilities of investment projects in agriculture, nor for capital market imperfections, and neglects the temporal dimension of credit contracts (Odening, 1991). Furthermore, it is difficult to quantify the degree of risk-aversion of a bank. However, the quantification of a farm-specific μσ-curve is possible and yields interesting results concerning the credit-worthiness of farms and the potential for whole-farm risk management. It will thus be pursued in the following.

A programming model for the analysis of whole-farm risk

Model specification

The portfolio selection theory and its application to agriculture can be well quantified in the framework of a mathematical programming model if the risk exposition of agriculture is explicitly taken into account. The latter can be done by incorporating information on the joint yield and price distribution of farm activities into the traditional programming model, and by calculating the respective variation for several levels of total farm income. Most often, time series of yields and prices are used for this purpose. If the above mentioned theoretical restrictions of the μσ-model are accepted, it would be consequent to apply a quadratic programming algorithm in order to maximise income with a parameterised restriction on variance (Hardaker et al., 1997; Hazell and Norton, 1986). Even more convenient and simple, however, is a linear approximation which became popular as MOTAD (minimisation of total absolute deviation). In this model, absolute deviations of the mean instead of the variance are used as a measure of variation, and the model is designed to minimise the variation for a given, but parameterised restriction on total gross margin or income (Hazell, 1971). Potential differences to the quadratic programming solution may be negligible in most cases, particularly if only small time series are available (Odening, 1994).

For the presented analysis, a linear MOTAD approach was chosen. The objective function of the model thus concerns the minimisation of absolute total deviations of gross margins from their respective means. By subtracting operating overhead costs not including permanent labour costs from total gross margin, the net operating profit is obtained. Allowances for permanent labour including management were not made since "payment" of farm workers' wages most often occurs in rather obscure ways. Frequently there is no legal payment at all, instead simply theft of farm products is tolerated. Farm managers and owners often cannot be distinguished, so the farm management is assumed to have decision power concerning the use of the profit. For the aforementioned reasons, the presented profit value has thus to be treated with caution.

Time series of gross margins were introduced as described by Hazell and Norton (1986). Main resources of the farm enterprise encompass 1,200 ha of irrigated cropland, 9,500 ha of cropland for dry farming, and 9,200 ha of extensive steppe. Most farms in Northwest-Kazakstan entail both crop and animal production. However, only crop production is explicitly modelled here, while animal production is taken into account through fodder crops. Their yield is multiplied with the value of the animal output produced with the respective fodder crop in order to obtain a revenue for it. Major crops are potatoes, sugar beets, several species of vegetables and maize under irrigation, various species of grain, sunflower, lucerne, and sudan grass for dry farming, and hay from extensive steppe land. In the model, a share of 16 percent of cropland for dry farming must be black fallow without vegetation cover in order to control moisture losses, build up organic matter, control weed and reduce wind erosion hazards. This share is still relatively small compared to official recommendations based on research results (Meyer, 1982). Since soil treatment is necessary for the required kind of fallow, costs are incurred by this activity. Further constraints of the model concern upper marketing limits for several cash crops, implying a rather inelastic regional demand as indicated above. A minimum share of silage maize was imposed on the model in order to ensure a minimum level of nutrition for the ruminants. In times of high rural unemployment, labour was not regarded as being a scarce factor of production.

A specific feature of the model concerns the investigation of the consequences of scarce working capital. For this purpose, a constraint on maximum working capital was introduced, which could be parameterised later. This allows the assessment of interest on additional working capital, and in this way the potential return on short-term credit.

A principal problem when using time series as a measure of variation concerns the fact that only existing production technologies can be modelled. For this reason, a systematic intensification of crop production e.g. by an increased use of fertilisers is not possible in the model, since the variance of this hypothetically improved technology is, of course, unknown. This has the somehow dissatisfying consequence that increased liquidity cannot be used for an intensification of crop production, because input-output ratios for the given crops are fixed. Furthermore, the complex economic consequences of dealing simultaneously with the problems of moisture recovery and water and wind erosion cannot be dealt with in the presented relatively simple model framework.

Data sources

The model was designed to analyse the main interesting features of an average farm in Northwest-Kazakstan. This synthetic farm was constructed to represent the situation in the region as typically as possible. Data and background information on the current situation of Kazak agriculture were collected during a research stay of the author in Kazakstan in early 1999. With respect to farm size, organisational structure, resource stocks and cropping pattern, the model presented here takes as a reference a former Sovkhose near the city of Aktyubinsk. This farm was privatised after national independence and was formally transformed into a joint stock company, which is currently the typical form of business organisation in Northwest-Kazakstan agriculture. Data on the cost structure of the different farm activities was taken from a data collection that claims to represent a larger region of Northwest-Kazakstan (Petrick, 1999a). The time series used to model risk entail the respective price-quantity combinations for a period of six years for all potential crops. Data on yields was taken from farm bookkeeping as given in Willms (1998) and, where lacking, was adapted from official statistics. Regional price information was taken from Tacis Agroinform (1999). Overhead costs on a hectare basis were taken from Brown (1997). All statements are in prices prior to the tenge devaluation in April 1999, implying an exchange rate of 85 tenge/USD.

Model results

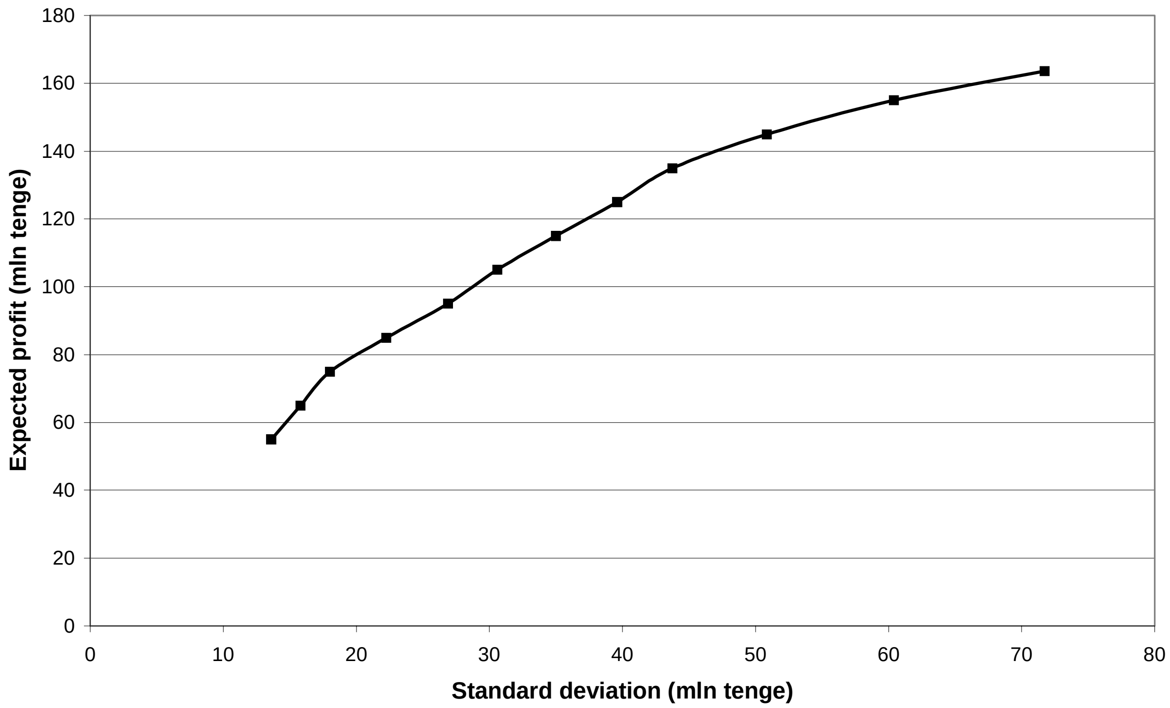
The results are presented in the following manner: First, the μσ-curve generated by the programming model is analysed in order to assess overall risk exposition. Second, results of the parameterisation of working capital are shown which allow to draw some conclusions on the return on short-term credit. Third, potential risk reducing measures as proposed by the model solutions are discussed.

Assessment of risk exposition

The μσ-curve generated by the linear programme is presented in Figure 4. It shows the trade-off between expected profit without labour costs and risk as measured by the standard deviation. As expected, risk over-proportionally increases with profit, implying a concave μσ-curve. The right-hand endpoint of the curve represents the risk-neutral solution, i.e. the maximum obtainable profit.

The presented figure differs in an important respect from what would be expected from portfolio selection theory: return and variation are given in absolute terms (profit and standard deviation), and not as percentage return on capital. This is due to the fact that data on capital stocks of farms was not available, which somewhat restricts the applicability of the model. However, this also is a reflection of the problems faced by banks when deciding on lending to agriculture: it is hardly possible to get reliable data on return on capital. As reported by Brown (1997), in a workshop for farm managers, agronomists, and government specialists in Kazakstan no consensus could be reached on what would be accurate figures for machinery and equipment values, depreciation, or interest due. This can be easily explained with the bad condition of most machinery, little investment made in recent years, and widespread unfamiliarity with western concepts of farm accounting. Even more difficult is an assessment of land value, as long as no land market is established. Without having information about return on capital, the optimal organisation in the sense of the theory outlined above cannot be given.

Figure 4: μσ-curve of a 20,000 ha farm in NW-Kazakstan



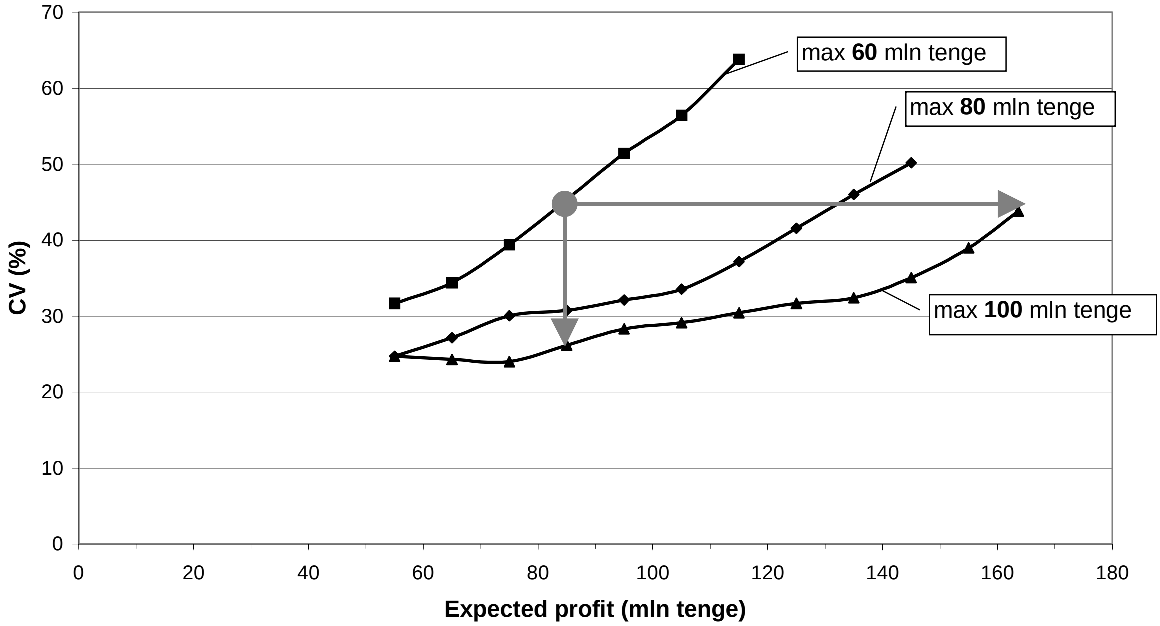
Source: Own calculations.

Nevertheless, to get an idea of the risk exposition of Kazak farms, the coefficient of variation (CV) as a standardised measure of variation was computed. According to the μσ-curve in Figure 4, the respective CV for different levels of profit varies in a range from 23 to 44 percent. Thus, even if the profit is reduced to half of its risk-neutral value, the variation is still higher than 20 percent. Compare this with other potential investment opportunities for banks, for instance a portfolio of shares. The CV of a three-year investment fund classified as medium risk in the standard capital market assessment (FAZ, 1999) is from 10 to 20 percent, and thus quite lower than that of a typical Kazak farm. Also farms in another region of the world facing highly variable production conditions show a much lower variation of income: Pannell and Nordblom (1998) in their study on Syria report income variations of less than five percent, which is even lower than the variation of the medium risk investment fund and much lower than the variation of the Kazak farms' profit. Syria can be regarded as a benchmark in this respect, since "few countries experience such an extraordinarily high degree of variability in national cereal production as Syria" (Nguyen, 1989, p. 78).
It can thus be concluded that a typical Kazak farm in its present shape shows a considerable risk exposition, which is significantly higher than that of farms in other climatically disadvantaged regions exemplified by the extreme case of Syria. Furthermore, compared to other investment opportunities, risk in Kazak agriculture is substantial, which potentially deters investors' engagement.

Impacts of liquidity constraints
A second question concerns the consequences of liquidity constraints with regard to farm organisation and risk management. To investigate this aspect, the constraint on working capital has been parameterised in the model. Selected solutions for three levels of constraints on working capital are presented in Figure 5 in the form of the standardised CV curves, starting with a limit of 60 mln tenge on the left. Axes have been interchanged compared to. It can be seen that relaxing the constraint on working capital shifts the CV curve to the right. Hence, holding risk constant, profit could be increased (horizontal arrow), or, alternatively

holding profit constant, risk could be lowered (vertical arrow) if more working capital were available.

Figure 5: Impact of liquidity constraints on the potential for risk management



Source: Own calculations.

This has been quantified as follows. Table 1 shows the respective levels of profit and the rate of return on additional working capital for different levels of risk measured by the CV. According to the rule of diminishing returns on increasing input use, the rate of return decreases with an increasingly relaxed constraint on working capital (compare fifth with sixth column). Furthermore, if there is a strong restriction on working capital (fifth column), the rate of return increases with risk, which is consistent with the general evidence of a negative risk-return trade-off. This effect vanishes, as the constraint is relaxed (sixth column). The figures allow the conclusion that the return will suffice for the repayment of short-term credit even at fairly high interest rates, as long as the attached risk is accepted.

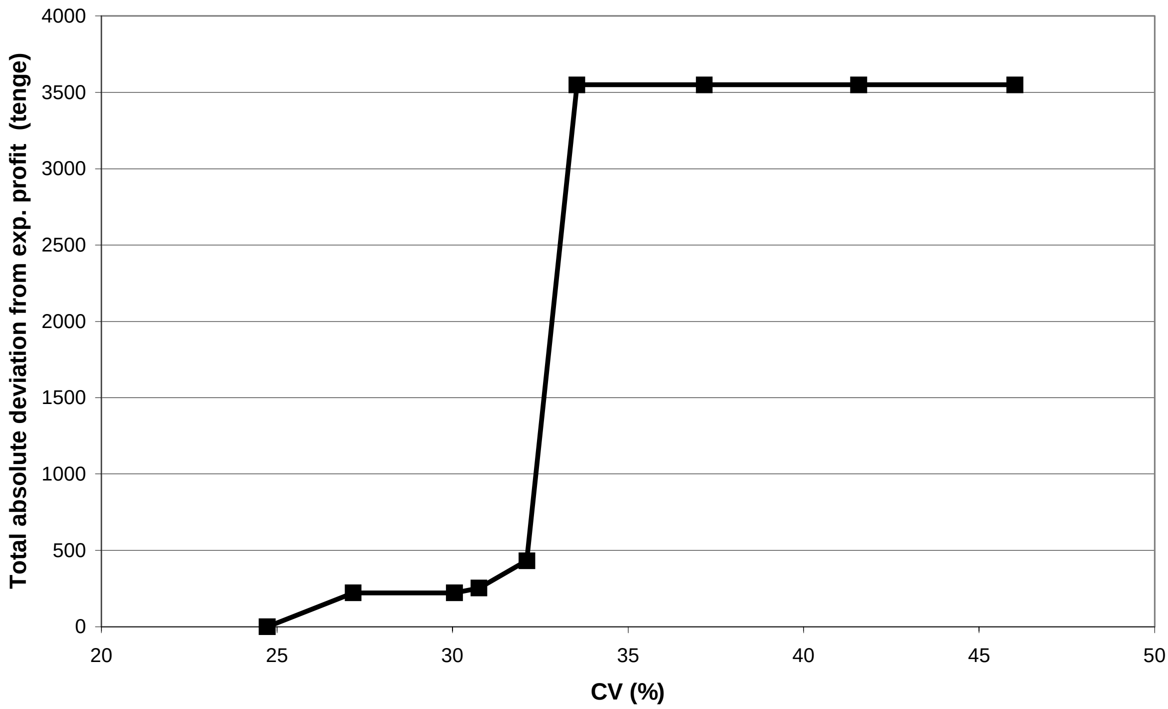
Table 1: Profit and return on additional working capital at various risk levels

Risk (CV)	Profit (mln tenge)			Rate of return on additional working capital p.a.	
	Availability of working capital (mln tenge)			Increase in working capital (mln tenge)	
	60	80	100	from 60 to 80	from 80 to 100
36%	68	112	147	120%	75%
40%	77	122	157	125%	75%
44%	83	130	163	135%	65%

Source: Own calculations

In the presented form of the model, the impact on risk reduction can be expressed as the shadow price of working capital. Since the objective function of the model minimises the variation, the shadow price has the dimension of total absolute deviation. For different levels of risk (and corresponding profit), the shadow price of 1,000 tenge working capital is depicted in Figure 6. Until a threshold of 33 percent variation, the shadow price over-proportionally increases with increasing risk. This implies that the risk reducing impact of additional working capital is the bigger, the higher the level of risk already attained. Beyond the threshold, the shadow price is constantly high, which means that other restrictions than working capital determine the model solution at this stage (e.g. marketing constraints).

Figure 6: Shadow price of 1,000 tenge working capital measured as profit variation

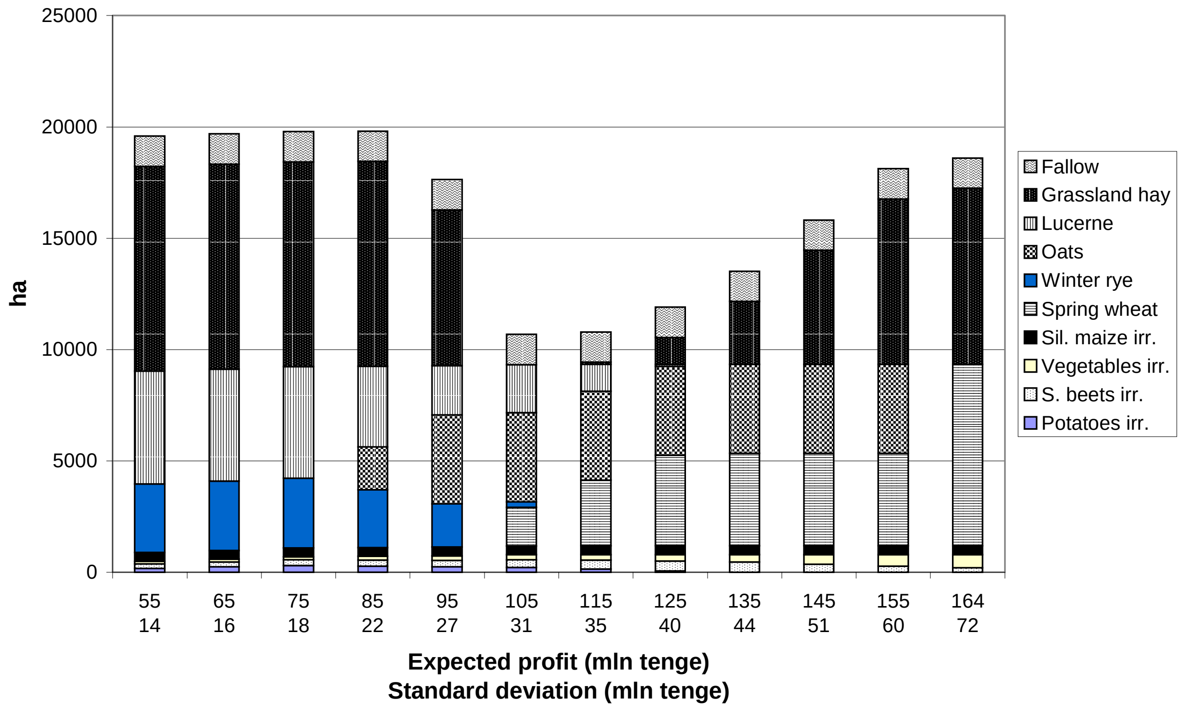


Source: Own calculations.

Short-term measures for risk reduction

A third result of the model concerns the short-term implications of risk reduction for the optimal organisation of the farm if resource stocks (i.e. land, working capital, marketing channels etc.) are fixed. In this case, risk management can only be pursued by means of diversifying production. Figure 7 shows the different optimal land allocations due to increasing levels of profit as well as risk from the left to the right according to the corresponding profit and risk values in Figure 4. Vice versa, starting from the right, the figure depicts the necessary changes in the farm organisation if risk shall be reduced. In fact, the risk neutral solution on the right hand comes relatively close to reality in Northwest-Kazakstan, with a high share of spring wheat in dry farming and vegetables under irrigation, and full use of the extensive steppe for hay production. Thus, when moving to the left, one can see the necessary steps to be undertaken in order to reduce risk by diversification. With regard to crops under irrigation, these steps mainly concern a reduction of highly variable vegetable production for the benefit of less risky sugar beets and potatoes. In dry farming, wheat may be replaced partly by oats and rye. Producing steppe hay (and the connected animals) and just doing nothing are good substitutes, which explains that steppe land is given up when moving to the left. In fact, the average gross margin of 1 ha steppe hay is quite low. At a profit-threshold of around 100 mln tenge, the relatively more risky wheat production is completely given up, which allows the use of the released capital to again extend hay (and animal) production.

Figure 7: Optimal land use due to changes in profit and risk levels



Source: Own calculations.

It should be pointed out that the model simultaneously considers climatic and economic risk. For this reason, the recommendations for risk reduction as stated above need not to be perfectly in line with what is emphasised by researchers solely concerned with plant production technology. With regard to the selection of appropriate crops, Zoerb (1965, p. 39) states that "wheat is the one crop that is better adapted to the such variable climatic conditions than any other, with the exception of the original grass cover which is now practically destroyed." On the other hand, the well-known former Soviet researcher A. I. Baraev proposed – apart from the advice to keep a sufficient extent of black fallow – to diversify cereal rotations in order to stabilise yields (Meyer, 1982; Rostankowski, 1979). Taking into account the economic risk of wheat production (i.e. mainly the risk of realising a sufficient price), the recommendation to concentrate solely on wheat production must be challenged on the basis of the results presented here.

Conclusions and implications for government policy

The analysis has shown that the risk exposition of a typical 20,000 ha farm in Northwest-Kazakstan is substantial compared to medium-risk investment funds or farms in other climatically disadvantaged regions of the world. Although the return on capital could not be calculated due to principal problems of data availability, a low level of credit supply to agriculture must be regarded as rational.

The consequences of increased farm liquidity were investigated by parameterising the upper limit of working capital. A larger limit principally allows farm managers either to generate an increased profit at constant risk, or to reduce risk at constant profit. Therefore, they find themselves in a kind of locked-in situation: the overall risk exposition of the farm hampers the inflow of external funds, but cannot be mitigated due to a lack of working capital. The results suggest that even relatively small amounts of credit could reduce whole-farm risk if a middle course is found which ensures sufficient return on the additional capital and thus attracts banks' interests.

In order to reduce risk in the short-run at given resource stocks of working capital, land, production technologies etc., a strategy of diversifying the production programme can be pursued. However, the effect of this form of risk reduction is limited.

More effective measures of risk management necessarily entail substantial restructuring and reorientation of agricultural enterprises, which implies the need for significant investment in new production technologies and processing and distribution channels for farm products. Most likely, this will only succeed if investors with a large risk-bearing potential can be found who become engaged in the whole production and processing chain.

Assessment of risk and risk management are both necessary in a market economy. If agricultural production in a certain region is considered as being too risky, resources will be better used elsewhere. Although increased liquidity could improve the risk management of farms as shown by the model, the government should abstain from supporting agriculture with soft budget constraints and cheap credit if agriculture in its present form is not viable. Even the introduction of seemingly market-conform measures such as a governmental crop and loan insurance system or a credit guarantee fund (both as proposed by Takambaev, 1999) should be treated with caution due to well-known problems of adverse selection and moral hazard. The task for the government in tackling the problems of risk in agriculture will be to develop rural transport and telecommunication infrastructure, to remove legal obstacles to collateralisation, to ease Foreign Direct Investment in the sector, and probably to establish or support a rural advisory service. This service would have the tasks of distributing the knowledge on sustainable cultivation practices, disseminating information on marketing channels and prices, and improving internal farm management.

The overall risk exposition of agriculture production in Northwest-Kazakstan is basically a result of the political decisions made during the Soviet era, when politicians were little impressed by economic constraints. Nowadays, without state support, production structures inevitably have to adapt to natural conditions. In the medium to long run this may imply the termination of agriculture in its present shape. Alternative forms may be found in extensive cattle grazing as had been done prior to collectivisation (Giese, 1983). In 1997, 39.6 percent of the total Kazak population lived in rural areas, i.e. roughly 6.7 mln people (OECD, 1999). The future of this rural population – of whom a considerable share was forced to settle in the region by Soviet authorities – remains an open question. A clear government strategy to develop alternative sources of income in rural areas is not in sight yet.

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