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DISCUSSION PAPER

Institute of Agricultural Development in Central and Eastern Europe

WHICH TYPE OF CROP INSURANCE FOR KAZAKHSTAN? – EMPIRICAL RESULTS*

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ABSTRACT

Risk plays an important role in agricultural decision-making, particularly in those regions that are remarkably exposed to natural hazards and underdeveloped input and output markets. This is especially true for crop production in CIS countries where many farms have to deal with low liquidity and sharp continental climate at the same time. The discussion paper analyses the results of expert interviews, a workshop with key-informants and a farm survey which investigated production conditions, risk attitudes and risk management techniques with respect to the requirements of a functioning crop insurance system in Kazakhstan.

JEL: G22, Q14, D82, Q81
Keywords: Risk, insurance schemes, agriculture, survey methodology, Kazakhstan.

ZUSAMMENFASSUNG

Risiko spielt eine wichtige Rolle im Entscheidungsprozess landwirtschaftlicher Unternehmer, insbesondere in Regionen, in denen die Produktion vielen Naturgefahren ausgesetzt und in unterentwickelte In- und Outputmärkte eingebunden ist. Das trifft besonders zu für die Pflanzenproduktion in den GUS-Staaten, wo viele Betriebe mit geringen Liquiditätsreserven und einem extremen Kontinentalklima zur gleichen Zeit umgehen müssen. Der vorliegende Beitrag analysiert die Ergebnisse von Experteninterviews, eines Workshops mit Schlüsselinformanten sowie strukturierter Interviews mit Unternehmensleitern zu Produktionsbedingungen, Risikoeinstellungen und Risikomanagementinstrumenten hinsichtlich der Voraussetzungen für ein funktionierendes Ertragsversicherungssystem in Kasachstan.

JEL: G22, Q14, D82, Q81
Schlüsselwörter: Risiko, Versicherungsprodukte, Landwirtschaft, Erhebungsmethoden, Kasachstan.

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1 INTRODUCTION AND BACKGROUND

Kazakhstan is a large country comprising 272 million hectares (ha), 32 per cent of which are classified as farmland. The population is approximately 14.9 million, 43 per cent of whom live in rural areas. Agriculture has traditionally been one of the largest sectors in the economy, (at present, approximately 8 per cent of GDP) and currently employs 32 per cent of the active population (STATISTICAL YEARBOOK OF KAZAKHSTAN, 2003). As a consequence of farm privatisation and enforced bankruptcies, unemployment in rural areas has been increasing, while absolute sector output has decreased by some 30 per cent since the pre-independence period (GRAY, 2000).

Crop production accounts for around 58 per cent of the agricultural sector output; crop production is, in turn, dominated by grain production, which accounts for 51 per cent of total crop sector output. Considering only private agricultural enterprises, the crop sector accounts for more than 85 per cent of total agricultural production. The livestock sector, principally comprising cattle and sheep, now accounts for some 42 per cent of the sector output (STATISTICAL YEARBOOK OF KAZAKHSTAN, 2003). According to expert assessments, Kazakhstan's wheat production is competitive and rainfed wheat has a comparative advantage (AHMAD and BRASLAVSKAYA, 2003)

Rural areas in Kazakhstan do not offer many non-agricultural business opportunities, rendering the agricultural sector the most important employer. But income in agriculture is, with only 40 per cent of the overall average income, rather low (STATISTICAL YEARBOOK OF KAZAKHSTAN, 2003). The rural population in Kazakhstan is not only plagued by low average income; an additional burden is the high degree of income risk and uncertainty to which, in particular, the agricultural population is exposed (KNERR et al., 2001).

A sharp continental climate has a heavy impact on yield variability, which is a serious risk for farmers. Additionally, natural hazards such as drought and extremely high temperatures often simultaneously affect a large number of farms over widespread areas in Kazakhstan. Thus, it can be supposed that production risk possesses a systemic component which results in a high correlation of yield losses across huge areas. That could be an explanation for the high variation in the level of national annual yields (appendix 1) (BOKUSHEVA, 2002).

Like many of the former Soviet Republics, Kazakhstan preserved compulsory agricultural insurance in order to help farmers manage their risks. However, the insurance schemes offered by the state during the last decade did not significantly differ from those of the Soviet period, when economically-sustainable production limits were widely ignored and the financial viability of insurance was not a question of great concern. Until 1997, the state insurance company KazGosstrakh provided insurance services for agriculture. In spite of the legal requirement that all legal farm entities carry risk insurance for all operations, the market for insurance remained under-developed and few farms were insured. Those which did buy insurance usually did so only to meet formal requirements for other purposes, such as access to credit. In 1998, the government established KazAgroPolis in order to develop a public-sector supplier of crop insurance. However, its operations remained very limited and, according to the National Bank of Kazakhstan (2002) after its last restructuring in 2001, KazAgroPolis lost its licence for providing any type of insurance services. In 2003, Kazakhstan's government prepared a draft law on compulsory insurance in crop production. According to this document, private insurance companies were allowed to provide crop insurance, and the government was obliged to pay 50 per cent of indemnity in case of crop failure.

This study is an integral part of a research project on the assessment of the risk exposure of agricultural production in Kazakhstan, the estimation of its impact on agricultural sector productivity, and the evaluation of possible government policies on promoting a sound institutional framework to manage agricultural risks.

The rationale for this empirical study, particularly the farm survey, is to obtain information about production risks Kazakh farmers face, their attitude towards risk, and the risk management instruments they apply. This information provides the basis for further analysis of potential risk management instruments for farmers in transition countries in general and under the prevailing production conditions in Kazakhstan in particular. No appropriate data was available before. In Kazakhstan and other CIS countries survey data collection in many cases is not affordable for socio-economic research institutes. This is the first publication investigating farmers' perceptions and attitudes towards risk in Kazakhstan.

The paper focuses on the analysis of preconditions for crop insurance as an efficient risk-management instrument and thereby tests the attractiveness of different schemes. Its main objective is to identify appropriate crop insurance solutions for farms in Kazakhstan. The contribution depicts the most important results generated by descriptive statistics. A deeper discussion of the results in connection to theoretical aspects of insurance, e.g. information asymmetries and the principal-agent theory will follow in further studies.

The paper is organized as follows: Section two provides a short overview of the research methodology. Section three reports about the farm survey's main results provided by descriptive statistics, and derives and discusses hypotheses. Conclusions are drawn in the final section. The appendix contains a figure that depicts the enormous grain yield deviations over time, a table that describes the different survey components and the farm survey questionnaire, including the complete results gained by employing descriptive statistics.

2 RESEARCH METHODOLOGY – PREPARING THE FARM SURVEY

The above-mentioned research objectives were approached by employing exploratory expert interviews, and a workshop with scientists, representatives of insurance companies, state institutions and agricultural interest groups. However, conducting structured personal interviews on the farm-level and collecting secondary statistical data on cropping areas, yields, prices and regional weather data were the most important elements of data collection.

The rationale for the aforementioned interviews was to gain insight in experts' perceptions of a functioning crop insurance in Kazakhstan. The interviews were conducted with 13 experts from insurance companies, chairmen of farmers' unions and agricultural trading companies and scientists from the disciplines Meteorology, Agronomy, and Agricultural Economics. They provided the basis for further refinements of the farm survey questionnaire. Furthermore, the interviews detected critical issues that had to be addressed on the workshop.

The workshop was designed to bring together different groups of experts with different interest with regard to crop insurance in order to stimulate discussion about crop insurance in Kazakh agriculture. A further objective was to present and discuss the selection of research regions and come to a conclusion about the final sample. The following two sections describe the selection of research regions and evaluate research methods and conditions.

2.1 Selection of research regions and farms

For our study purposes, i.e., a study of a large geographically dispersed population (farms), it was convenient to use a multi-stage sample design. This is a type of design where in the first stage a sample of larger units is selected (the oblasts in our case[1]), then in the second stage, from each of the selected first stage units a sample of smaller units (rayons in our case) is chosen. The last step included a selection of farm enterprises and individual farms in the rayons. For these purposes, a Simple Random Sample (SRS) procedure was employed (POATE and DAPLYN, 1993, pp. 61-65). A multi-stage design is particularly appropriate where a large-scale survey is to be conducted, and where for logistical and organizational reasons it is convenient for the sample to be grouped together in a more limited number of geographical areas, rather than being spread thinly and dispersed across the country (POATE and DAPLYN, 1993, pp. 58-59).

The selection of representative oblasts was carried out using statistical data and expert statements from the first project workshop, and by taking into account various criteria as noted below. Methodological principles used for the selection of oblasts and farms were based on the combination of typological and structural grouping methods (BOEV, 1995). Official information from the Agency for Statistics of the Republic of Kazakhstan served as a data base for the selection process (STATISTICAL AGENCY, 2001).

The selection of research regions was conducted based on the following indicators: 1) gross output of the crop production sector in monetary terms; 2) share of the crop production sector's gross output of total agricultural output in each oblast; and 3) share of rural population in each oblast of total rural population of the country. The first indicator shows the place of the oblast in the country's crop growing sector. This is the key indicator. The second indicator allows the assessment of the crop-growing sector's importance in agriculture as a whole by oblast. This criterion also indicates agricultural specialisation (crop production or livestock industry) of an oblast. The third indicator provides an opportunity for ranging the oblasts based on the number of people whose material well-being is directly connected to the state of agriculture. In other words, the indicator highlights the regions of population concentration whose welfare depends mostly on agriculture. The integration of the three indicators mentioned above has been made in the following way: For each indicator, oblasts have been ranged. Then, each indicator (criterion) is awarded a weight. The most important criterion – gross crop production output – was given a weight of 1. The second criterion – gross crop production output to total agricultural output ratio – is granted a weight of 2. The third criterion – percentage of population living in rural areas – had a weight equal to 3. An oblast's rank in each criterion was to be multiplied by its weight. Then the total number of points was calculated for each oblast. The oblast with the lowest total number of points was of the highest priority, while the oblast with highest total number of points was of the lowest priority. Taking into account the factor of representativeness of different geographical regions with different geo-morphological and agro-climatic conditions, as well as the production of strategic crops such as wheat, cotton and oil crops, Akmola, North Kazakhstan, South Kazakhstan and East Kazakhstan, respectively, were chosen as possible regions for the farm survey (Figure 1).

The region selection procedure was presented at the workshop with key actors, that took place in the capital of Kazakhstan, Astana. The workshop objective was to inform the participants about the research objectives and basic principles of crop insurance, and on this basis to gain information for further empirical investigations, particularly with respect to the selection of

[1] An oblast is an administrative region comprising several rayons (smaller administrative districts).

survey regions. Through moderation and visualization techniques that facilitated discussions, workshop participants could make statements regarding the most important regional and supra-regional risks, preferred insurance products and their design possibilities. The discussion of the selection procedure with workshop participants came to the conclusion to introduce two additional regions into the initially formed sample: Kostanai in the North and Aktobe in the West in order to take into account the specific production conditions in these regions (Figure 1).

In the second stage, between two and four rayons per oblast were selected according to the criteria 'natural yield potential'[2] and 'relative importance of crop production'[3]. Data from the regional statistical agencies served as a base for the selection process. Moreover, the selection process was supported by the directors of the regional departments of agriculture by providing valuable information on the local research conditions.

Figure 1: Kazakhstan: Survey regions

Source: Own presentation.

2.2 Evaluation of research methods and conditions

To provide a first assessment of the experiences with the survey instrument, it must be stated that the field work demonstrated the highly suitable nature of the questionnaire. An important reason for this suitability was the conducted pre-test, which helped to modify questions according to experience. The various parts with different types of questions worked well, including the relatively complex table in part three (see appendix). Data verification procedures

[2] This criterion takes into account historical yields, soil quality and agro-climatic conditions.
[3] I.e. physical output of the strategically most important crops relative to other rayons in the same oblast.

showed that most of the collected answers were plausible and useful. In most questions, the quality of data exceeded the expectations of the research team – non-responses remained within acceptable ranges (see appendix).

The exception was the accounting information, which was not always provided to a satisfactory level. The quality of accounting data varies greatly across farms. While smaller private farms might not have any records at all for the past years, larger, well-performing farms sometimes have an army of accountants. However, only the main accountant has an overview of the data, but usually is not obliged to pass on information to a third party without the agreement of the head of the respective enterprise. That makes it necessary to obtain an appointment with both persons. The last point shows the importance of hierarchy in Kazakh institutions. The outstanding role of the head is inherent to the system and is an obstacle to both the functioning of the institutions itself and the efficiency of their clients. In addition, many farms in Kazakhstan were restructured several times in recent years, and even if they do have an accountant today, they might not have any data for previous years. Even with the support of the local administration, farms with a satisfactory accounting organisation were not always selected.

Besides the structured interviews with a sample of farmers, data on yields and crop areas was collected for about 200 farms in 17 rayons for up to 40 years. This data was collected in various national, regional, and local institutions. Staff and data resources in the departments of statistics and agriculture vary significantly across rayons, and thereby the degree of necessary support for researchers also fluctuates. For the evaluation of systemic risk, long time series (1960-2003) of yields and sown areas for the most important agricultural crops on a farm-level basis were collected. But as a result of different organizational and structural reforms and changes, this data is scattered among different institutions, i.e., oblast and rayon statistical and agricultural departments and archives. The authors are able to safely say that each rayon has its own rules. Thus, data collection resembles detailed detective work. Equally, the access of foreigners to the non-secret agricultural data is regulated and managed in different manners across oblasts and rayons.

Additionally, meteorological data on temperature, precipitation, humidity and soil moisture is available for several rayons. The data is used to test for the statistical correlation between meteorological coefficients and yield and the development of functioning index-based insurance schemes.

Appendix 2 provides information on the different survey components: It describes their objectives and informs about the respondents to the different parts of surveys, the number of observations, the character of the extracted data and the time span when the data was collected. The components constitute a crucial part of the research and contribute to the aforementioned project objectives by providing the data base for further analysis.

The multi-stage sample design was employed to create nationwide representativeness, however the stratified randomness of the agricultural producers' sample is weekend by the achieved number of observations. The major reason for this were the inevitable budget and time constraints. Nevertheless, the data is expected to provide a satisfactory basis for generating valid risk management related hypotheses and their tests.

The evaluation the farm survey allows a number of tentative conclusions. First, more than half of the respondents had some or even much interest in responding. Second, the majority of respondents was qualified to answer the questions posed. The overall evaluation by the interviewers was positive.

3 RESULTS AND DISCUSSION

Section 3 aims at highlighting both, the findings from interviews and the workshop as well as the main results of the farm survey. Section 3.1 presents and discusses the workshop results and the outcomes from the expert interviews together in order to ensure a better comparability.

3.1 Results of expert interviews and workshop findings

According to the workshop participants, drought and early frosts at the end of the cropping period are, for all considered regions, the most important risks. Other risks such as pests, diseases and hail play a lesser role in yield deviation. Nevertheless, a majority of the participants demands all risk or multiple peril crop insurance, while a large share prefers income insurance to yield insurance.

A comparison of the workshop results to the expert interviews, which were operationalised through structured questionnaires, shows similar results. In the framework of the expert survey, the same target group as in the workshop was addressed. Although introductory explanations were shorter, the number of questions was larger. Particularly, the questionnaire dwelled on the possible form of relevant insurance products. Some examples are: The possibility of selecting coverage, the introduction of a mechanism that allows the inclusion of weather conditions in the design of insurance products, and regional differentiation of insurance products. The potential of weather-index based insurance products is a controversial topic among experts. However, further studies show that these products are realistic and economical alternatives to conventional ones, if the included weather coefficients are correctly weighted (BOKUSHEVA, 2004).

Another contentious point is whether or not a mandatory insurance scheme offers advantages to a voluntary programme for a transition country like Kazakhstan. The advocates of a mandatory scheme have more trust in a system where the state represents a central power that regulates the insurance market and grants the agricultural sector basic risk coverage. For the question of whether insurance contracts should be long-term or only for a period that includes sowing to harvesting, no clear tendency can be identified. A more clear-cut factor is the introduction of deductibles: Representatives of insurance companies particularly value the positive effect of this instrument in reducing moral hazard. According to the expert statements, a reasonable, and for farms financially sustainable, rate lies around 30 per cent.

Another question that was intensively discussed in both the workshop and expert interviews is the monitoring mechanism. In principle, there are different solutions to production control and damage inspection. Apart from remote sensing, which is associated with high technical input, a system of independent insurance experts, paid by the state and acceptable for all parties, could be established. Moreover, parametric, weather-based insurance would drastically lower the input of on-farm damage evaluation.

3.2 Farm survey results

3.2.1 Questionnaire contents[4]

The questionnaire is structured in five sections. The first section asks for standard personal characteristics from the respondent such as age and education. The questions concerned with the personality of the respondent fulfil two purposes: Firstly, they belong to the so-called warming-up phase; after the introduction of the enumerator, the respondent gets the opportunity to tell something about himself. Secondly, these questions serve to obtain an assessment of the educational background of the studied population. The questions in section two try to steer the respondent towards specific aspects of crop insurance schemes such as preferences associated with insured crops, contract duration, level of deductibles, and so on. Part three asks about local natural conditions of crop production and the characteristics of the most frequently experienced natural hazards. Section four evaluates respondents' attitudes towards production risk and tries to assess their risk management behaviour. The main objective of this part is to formulate an impression about the willingness to take risk, risk management responses and the consequences of risk the farmers are most concerned about. It is important to give the respondent the full spectrum of answering possibilities on a five-point Likert-scale, i.e. not to restrict him to the three possibilities "strongly agree", "neutral" and "strongly disagree".

Part five of the questionnaire summarises the evaluation of the survey given by the enumerators. This part is designed to provide the enumerator with the possibility of supplying a short personal assessment of the respondent.

3.2.2 Key characteristics of respondents and farms

Interviews were conducted with 73 respondents (farmers and managers of agricultural enterprises), 32 of which are limited companies (43.8 per cent), 26 individual enterprises (35.6 per cent), 14 producer co-operatives (19.2 per cent), and 1 state enterprise (1.4 per cent). The average agricultural area of all interviewed enterprises is around 9687 ha, ranging between 4674 ha in South Kazakhstan and 25583 ha in Kostanai. Wheat production is economically the most important branch in Kazakh agriculture. Consequently, the study enterprises comprise a large proportion of wheat producers (71.6 per cent), a smaller proportion of cotton farmers (17.6 per cent) and a small share (10.8 per cent) of mixed farmers who produce vegetables and fruits, for instance, in addition to grain crops and cotton.

The respondents were, on average, 51 years old, ranging between 33 and 70 years, with only seven respondents younger than 40. The educational background of the respondents is quite diverse: More than 69.9 per cent graduated from university, 11 per cent visited a vocational college and 12.3 per cent a secondary school. Just 2.8 per cent attended only elementary or vocational school, while 1.4 per cent could not read and write at all. Regarding agricultural educational background, the majority of respondents studied agriculture: While 30.0 per cent have practical experience solely, 1.4 per cent attended short theoretical courses in the past. Another 2.7 per cent visited a vocational school, 8.2 per cent an agricultural secondary school, and 57.5 per cent an agricultural university. 53.4 per cent of the respondents took additional training courses after schooling and higher education respectively, 5.1 per cent of which in food processing, 25.6 per cent in management and 48.7 per cent in other fields.

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[4] The appendix contains the farm survey questionnaire, including the complete results gained by employing descriptive statistics.

The natural production conditions in the survey regions, and thereby the yield levels and fluctuations, vary widely across farms, e.g. the average yield power[5] of all sample farms is 39 (of 100), ranging between 12 and 66 (means: Akmola 42, North KZ 46, Kostanai 44, Aktobe 26, East KZ 47, and South KZ 28). For the selection of the research rayons the regional committees of land resources provided data on the average yield power values for the total agricultural area in each oblast (s. Table 1). The regional differences in natural conditions are reflected in different average grain yields and fluctuations of the grain yields over time. Correlations between aggregated grain yields and yield power values are not reasonable, since the reference areas for both values are not identical and different grain crops have different production elasticities with regard to yield power.

Table 1 shows grain yields for all Kazakh oblasts from 1970-2001. The yield power values of six research regions reflect approximately the average grain yields. Only South Kazakhstan's relatively high value cannot be explained by yield power. In this region, as well as in Kyzyl-Orda[6], irrigation of crops is an additional stimulating factor for yield values.

Table 1: Regional grain yield characteristics 1970-2001 (unit: 100kg/ha)*

Region	Mean	Min	Max	Stand. dev.	Yield power[7]
Akmola**	9.3	3.6	17.0	3.4	39
Aktobe	6.5	1.1	10.9	2.7	13
Almaty	12.1	4.8	21.6	4.1	
Atyrau	3.5	0	9.6	2.8	
East Kaz	12.4	5.6	17.7	3.3	39
Zhambyl	11.4	3.3	22.8	4.5	
West Kaz	7.5	1.6	16.4	4.3	
Karagandy	6.8	2.9	15.0	3.1	
Kostanai	10.2	2.7	14.9	3.8	38
Kzyl-Orda	33.7	14.0	43.7	7.0	
Pavlodar	6.0	2.6	12.2	2.5	
North Kaz	12.8	6.7	18.7	3.6	43
South Kaz	13.8	4.3	21.3	4.3	35

Notes: * Data from regional departments of statistics.
** Research regions are marked bold.

3.2.3 Attitude towards crop insurance products

Past experience with insurance respective to crop insurance has an important impact on current attitudes towards crop insurance. 31.5 per cent of interviewed farmers reported having

[5] The yield power of a soil is a function of soil type, actual state of the soil and local agro-climatic conditions such as temperature and precipitation. The maximum yield power is 100.

[6] Here, aside from wheat and barley, rice plays a major role in grain production (approximately 71 per cent of total grain production area). Rice yields in this oblast are three to four times higher than yields of other grain crops.

[7] The value for SK is the average yield power of the irrigated land.

experience with crop insurance in the past, mostly under the centrally-planned economic system of the Soviet Union. 64.4 per cent of the total group of respondents would like to insure crops in the near future. 80 per cent of farmers in the three Northern oblasts (Akmola, North KZ and Kostanai), 77.8 per cent in East KZ, 60 per cent in Aktobe, and only 39.1 per cent in South KZ would, generally, like to insure their crops. These results reflect the production situation of the enterprises under investigation. In South KZ, farms are smaller, more diversified and have at least a part of their land under irrigation. The respondents who did not want to insure had several reasons for their attitude: 47.1 per cent do not believe that insurance can pay off its costs, 17.6 per cent had bad experiences with insurance in the past, 5.9 per cent made insufficient liquidity of their enterprises responsible for their decision. 29.4 per cent named other reasons, such as distrust in private insurance companies and sufficient on-farm risk management. Despite the facts that the crop insurance system during the 1990s did not work properly and many farms remained uninsured, and the negative experiences Kazakh citizens had with the introduction of compulsory health insurance, 37 per cent of the respondents believe that crop insurance in Kazakhstan should be compulsory. The most frequent explanation for that answer was that all farms are exposed to risk.

Assumptions about a correlation[8] between age and the preference for or against compulsory crop insurance were not proven by the data: The average age of an opponent of compulsory insurance was only one year younger than an advocate. Likewise, the test for a relationship between one's risk attitude and willingness to procure long-term contracts[9] that did not produce significant results. Respondents that would be willing to sign contracts spanning three to five years often named stability as a reason. The will for stability in this question is not connected to the risk attitude value that was captured by questions 4.1.3 to 4.1.5 (s. a. section 3.2.4)

The introduction of deductibles to insurance contracts plays an important role in counteracting moral hazard problems. For that reason, we tried to test for the willingness to procure such contracts. The majority of respondents had a positive attitude to deductibles (66.2 per cent). The individually sustainable rate of deductibles varied between 5 per cent and 50 per cent of the insurance sum (mean: 24.9, standard deviation: 9.6). 77.1 per cent perceive 20 to 30 per cent of the insurance sum as a sustainable deductible rate (question 2.6.1). All interviewed representatives of insurance companies perceived deductibles as a reasonable element of insurance contracts and assessed the sustainable rate of deductibles for farmers at about 30 per cent.

The enterprise specialisation, as well as the importance of cash crops to enterprise performance, is reflected in the answers to the question which crops should be insured: Wheat (55 per cent), barley (18.8 per cent) and cotton (17.5 per cent) make up a large proportion of all crops that could potentially be insured. Regarding the number of perils that have to be insured, 15.4 per cent of the respondents would prefer all-risk insurance, 70.8 per cent would like to be insured against a group of most important risks, and for 13.8 per cent an insurance against just one predominant peril would be appropriate.

What kind of risks have to be insured is assumed to be dependent on the considered crop, i.e. the extent individual crops are exposed to natural hazards and price risks. Results in Table 2 show, for all considered crops, a clear tendency to vote for income insurance (47.9 per cent) and crop-yield insurance (43.8 per cent) rather than an insurance of price risk. A possible explanation

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[8] The correlations between metric variables were estimated based on t-tests. Kendall's Tau-tests were used to estimate correlations between ordinal variables.

[9] A vast literature on the principal-agent problem is treating long-term contracts as moral hazard reducing (e-g- LAMBERT, 1983)

approach could be the interaction of risk of natural hazard and price risk. Both types of risk are reflected in income risk. Farmers assess price risk to be adequately covered by income insurance.

Table 2: Crop-specific insurance types*

Insurance against / Crop	Price risk (induced by price fluctuations)	Risk of natural hazards (crop failure)	Income risk
Wheat (N=42)	.071	.381	.547
Barley (N=17)	–	.529	.471
Cotton (N=16)	.063	.375	.563

Note: * The numbers reflect the share of respondents preferring given type of crop insurance.

Table 3 depicts average wheat yields and price indices (average price from after harvest to harvest of the following year) for all investigated regions in Kazakhstan. The data shows no uniform tendency across all regions. Especially prices in Aktobe are in the period 2001-2003 higher than in 2000. In most of the other regions wheat prices in 2001 and 2002 are lower than in 2000. Only in 2003 prices in all regions are relatively higher than in 2000. The tentative calculation of correlation coefficients showed that farmers could not rely on the 'natural hedge' effect, i.e. there is no negative correlation between yields and prices. Distorted grain markets might be the most important obstacle to natural hedge[10]. However, a lack of consistent price time series without structural breaks eliminates the estimation of efficient correlation coefficients.

Table 3: Wheat yields and relative prices 2000-2003

		2000	2001	2002	2003*
Kazakhstan total	Average yield (in 100 kg)	9	11.8	10.9	11.3
	Price index Sept.-August**	100	97.0	83.9	129.1
Akmola* **	Average yield (in 100 kg)	7.6	10.8	8.7	9.9
	Price index Sept.-August	100	90.6	79.0	133.9
Aktobe	Average yield (in 100 kg)	7.5	7.7	5.6	9.0
	Price index Sept.-August	100	116.8	106.5	158.1
Kostanai	Average yield (in 100 kg)	10.6	11.8	11.8	12.2
	Price index Sept.-August	100	103.4	92.5	126.3
South Kazakhstan	Average yield (in 100 kg)	12.7	15.2	22.7	22.3
	Price index Sept.-August	100	103.6	77.4	100.8
North Kazakhstan	Average yield (in 100 kg)	8.8	13.9	10.8	10.8
	Price index Sept.-August	100	92.4	82.7	131.3
East Kazakhstan	Average yield (in 100 kg)	13.9	15.3	16.7	12.1
	Price index Sept.-August	100	100.3	75.8	132.3

Notes: * For 2000-2002: yield before processing, for 2003 only data for yields after processing was available. We therefore assumed a factor of 0.9 for the yield after processing. This assumption is supported by ISKAKOV and SUNDETOV (1978) and SUNDETOV (1982).

** The prices from 2001 to 2003 are expressed relative to the price in 2000.

*** Major wheat growing regions are in bold.

[10] The argument that prices do not reflect the supply of grain is a sign of distorted grain markets and can be supported by the following excursus.

Excursus: Grain markets in Kazakhstan

Grain market power is highly concentrated, as illustrated in the following example: Prodovolstvennaya Kontraktnaya Korporatsiya (Food Contract Corporation (FCC), or Prodkorporatsiya), an agricultural trading Joint Stock Company and Kazakhstan's main grain procurer for the state reserves, bought 2.368 million tonnes of grain from the 2003 harvest for the state reserves in 2003. The country exported almost 5.816 million tonnes in 2003, a large share of which was exported by large grain trading companies. Kazakhstan harvested 14.8 million tonnes of grain in 2003 (FOOD AND AGRICULTURE REPORT, 2004). That means more than half of the grain harvest is concentrated in the hands of a relative few with strong bargaining power. Crop production requires upfront financing such that expenses on variable inputs are due in period 0, whereas returns occur in a period that is different from 0 – the period lies between several months and several years (permanent cultures) after the settlement date of production costs. In Kazakhstan, the procurement of grain and other crops for the state reserves is done by a two-tier system that includes spring-summer advances for fieldwork (70 per cent) and direct fall purchases (30 per cent) (USDA, 2004), i.e. farms with low liquidity are highly dependent on grain buyers' payments.

3.2.4 Regional weather conditions and natural hazards

As mentioned in the introductory section, agriculture in Kazakhstan is strongly affected by the sharp continental climate with very hot summers and extreme winter frosts as well as large fluctuations in seasonal temperatures, in summer even in daily temperatures. Spring frosts are an obstacle to early sowing and early frosts in autumn restrict yields. A strong deficit in soil humidity in spring connected with atmospheric drought and dry storms (sukhovei) have a negative influence on crop production (SPAAR and SCHUHMANN, 2000).

The survey respondents considered drought as the most important risk for their businesses, followed by hail, varmints invasion, and spring frosts. The geographical extension of the hazards is varying as the table in question 3.2 in the appendix is showing. While drought affects always widespread areas, hail is a fairly local event. Pest invasion and spring frost are varying with respect to extension.

Like the extension, also the frequency is varying across perils. Pests are the hazards, that farmers who named them as one of the most important group of hazards experience most frequently, i.e. in 6 of ten years. Drought and spring frost affect crop production every third year, hail appears every fourth year in average.

The aforementioned natural hazards can locally induce crop losses up to 100 per cent of the expected yield, in average the losses vary between 39 per cent as an effect of hail and 58 per cent caused by drought.

Only 54 per cent of the respondents apply on-farm risk management measures currently. Mostly agro-technical methods, like accumulating snow on crop areas from surrounding areas are applied against drought. In order to fight the negative effects of pests, insecticides are applied. Fruit producers who experience spring frost use fumes and water films to protect their plants. In the cases of all four perils only a minority of the respondents see additional risk management instruments on farm.

For a large majority of the respondents on-farm risk management measures are preferred to crop insurance. Nevertheless, there is a demand for the residual risk that cannot be efficiently managed on farm.

3.2.5. Farmers' risk attitudes

In part four of the questionnaire, producers were asked to rank on a Likert-scale from 1 to 5, the importance of various sources of income variability which create risk. Respondents were also asked to assess the importance of various management responses to variability, as well as their concern about risk consequences. Furthermore, producers had to assess themselves in their role as decision-maker in risky situations (questions 4.1 and 4.5).

For policy purposes, we often need more than just a qualitative analysis. We would like to know, how important is risk in agriculture and in particular how large is the response to a change in risk and in which direction will it take place. To answer the second question, in particular, to know how farmers would respond to the kinds of changes in risk induced by income stabilisation programmes, we need to be able to infer that the individual's behaviour towards this new risk situation will be similar to his behaviour towards earlier risky situations which he has faced (NEWBERRY and STIGLITZ, 1981). For that purpose, five statements were included in the questionnaire in order to gain insight into producers' risk attitudes (question 4.1). Questions 4.1.3 to 4.1.5 were used to construct a risk aversion[11] index (*RATT*) [12], since they reflected farmers' attitudes to production risk best. Values of the *RATT* index give an impression about how risk averse farmers are relative to other farmers in the investigated population. Low *RATT* scores mean an increasing relative risk aversion. The mean coefficient for the total sample is 2.52, expressing that respondents are rather agreeing with risk-aversion statements. Table 4 depicts the results of the risk aversion analysis differentiated by region. Risk aversion is slightly lower in East and South Kazakhstan, where the diversification of enterprises is more advanced, but t-test statistics show no significant differences between respondents of different regions.

Table 4: Risk aversion indices by regions

Region	RATT index	Stand. Dev.	Min	Max
Northern Kaz (Akmola, Kostanai, North Kaz)	2.44	1.33	1	5
Aktobe	2.53	1.04	1	3.67
East Kaz	2.70	1.09	1	4
South Kaz	2.57	1.57	1	5
Kazakhstan total	2.57	1.35	1	5

The constructed index is not related to the coefficient of relative risk aversion[13] introduced by ARROW (1965) and PRATT (1964), which might be validated to some extent by constructing a representative risky prospect, computing its certainty equivalent and then asking the decision-maker whether the implied indifference between the risky and the sure prospect seems reasonable (ANDERSON and HARDAKER, 2002). During the first interviews Arrow-Pratt risk-

[11] Definition of risk aversion: "Individuals who accept a lower average return to reduce the variability of returns are said to be risk-averse" (HARWOOD et al., 1999).

[12] The coefficient was produced by calculating the arithmetical means of ordinal numbers which were provided as answers to each question. In a second step the overall mean was calculated.

[13] $R_r = \frac{U''}{U'} W$, where *U''* and *U'* indicate, respectively, the second and first derivative of the von Neumann-Morgenstern utility function and *W* indicated the level of wealth.

aversion tests were conducted. However, the test needs intense explanation and are thereby time consuming. Only few respondents were motivated to participate in the test. The research team decided to cancel the tests in favour of the simplified, but empirically practical measure (as described above) that shows relevant tendencies of risk aversion.

In addition to the questions that aim to measure risk attitude by an index, the respondents were asked to assess their willingness to take risks relative to other farmers (question 4.6). Results show that farmers assess their behaviour as more risk-loving relative to others (mean: 3.44) – across different management areas only slight variations can be observed (see appendix). However, besides the level of risk aversion and the supplied form of insurance, other factors that influence the extent to which schemes will appeal to farmers are the availability of other risk management strategies, the variability of yields and prices, the price/yield correlations, the ad hoc support provided by governments in case of disasters, and farmers' perception of risks (MEUWISSEN et al., 1999, p. xv).

In question 4.2 (see appendix), farmers were asked to indicate the largest percentage of their current expected yield they would be willing to give up for an absolutely stable yield every year, assuming a hypothetical new method of growing. The question aims at providing an idea of the premium price producers would be willing to pay for a crop insurance product that stabilises revenue. Results were analysed for wheat and cotton farmers and show a lower value for the former. Taking into consideration the relatively lower wheat yields and prices, the average willingness to pay per hectare is less for wheat ($10.49) than for cotton ($79.42) (see Table 5). However, the exact amount of money farmers are willing to pay for specific forms of income insurance can only be tested by pilot programmes (MEUWISSEN et al. 1999, p.xv).

Table 5: Average wheat and cotton producers' willingness to pay for yield stability

Crop	Largest percentage of current expected yield (mean)	Average yield, 100kg/ha (1998-2003) (national level)	Average price, $/100kg (1998-2003) (national level)	Average gross revenue, $/ha (national level)	Average willingness to pay for yield stability, $/ha
Wheat	15.00[1]	10.02[2]	6.98[3]	69.96	10.49
Cotton	18.14[1]	20.17[2]	21.70[1]	437.84	79.42

Notes: [1] Own survey data.
[2] FAO data.
[3] Data from TACIS Marketing Project.

3.2.6. Perception of risk sources, consequences, and management responses

Different sources of risk were analysed according to their importance in decision-making. The most important source of risk among respondents are crop price fluctuations as it is reflected in its high ranking in question 4.3 (see Table 6). 94.1 % considered price fluctuations as an important to very important source of risk (mean: 4.58 on a five point Likert-scale). Two other particularly important sources of risk and uncertainty are changes in costs of variable inputs (4.58) and in cost of capital items (4.01). The output as well as the input price volatility might be related to transition forces, particularly the undergone change in the institutional framework. Terms of trade have been altered due to high contracting costs in the agricultural sector following the deterioration of input and output channels. The fact that crop price variability is the most important risk source for decision-making, but respondents would prefer income or natural hazard insurance might be explained by the assessment of risk

management instruments. The respondents might consider price insurance not as the most efficient risk management instrument to mitigate the negative effects of crop price variability. Crop yield variability is an important source of risk in Kazakh crop production. Although, its importance regarding decision-making of the interviewed farmers is low compared to other considered risk sources. This might on the one hand be attributed to the limited opportunities to further minimize yield variability. On the other hand the last production years were not influenced by severe droughts, with the consequence that farmers perception of yield variability as an important risk source for their decision-making diminishes. The ranking of the discussed and additional risk sources is demonstrated in Table 6.

Table 6: Evaluation of risk sources according to their importance in decision-making*

Risk sources	Mean	Stand. deviation
Crop price variability	4.58	0.85
Changes in cost of inputs	4.49	0.85
Changes in costs of capital items	4.01	1.22
Changes in credit availability	3.79	1.42
Changes in government commodity programmes	3.76	1.25
Changes in technology	3.64	1.33
Changes in land rents	3.56	1.56
Crop yield variability	3.54	1.35
Changes in interest rates	3.41	1.49

Note: * (5 point Likert-scale: 1 – not important, 5 – very important).

Business risk has different economic consequences for agents. Farmers are assumed to evaluate risk consequences based on the actual performance of their enterprise as well as their personal experiences with respect to risk of their businesses. The respondents were most concerned about low income (mean: 3.91; standard deviation: 1.16), followed by insolvency (3.21; 1.26) and equity losses (3.14; 1.76). The reduced possibilities of receiving a credit and the loss of equities were even of lesser importance for the study population. In this context, it is interesting to look at the results of question 2.15: The respondents defined a crop loss of 26.5 per cent, on average, as catastrophic for their enterprise. This relatively low value can be explained by the strong specialisation of farms and the relatively low yields. 26.5 per cent of an average wheat yield of 1.2 tons is slightly more than 0.3 tons per hectare, a value that is almost negligible for Western European farmers.

Question 4.4 evaluates the importance of risk management responses. The responses can be structured in three categories: Diversification of farming enterprises, geographic dispersion of production, being a low cost producer and having back-up management/labour can be summarised as production responses (mean: 2.96 on a five point Likert-scale). Government farm programme participation and forward contracting can be categorized as marketing responses to risk and were evaluated as slightly more important (3.04). The group of risk responses that received the highest scores, on average, were financial responses, i.e. crop insurance, life insurance, off-farm investments and employment, maintaining financial reserves and leverage management (3.40). Considering the full list of responses, the three most important ones were maintaining financial/credit reserves, being a low-cost producer and off-farm employment. Interpreting especially the results on risk management, one has to keep in mind that farm restructuring in the 1990s may have led to an extensive loss of knowledge due to changes in management structures and migration of specialists into other

sectors of the economy or abroad. Especially on-farm risk management is a matter of experience.

The results generated by descriptive statistics provided a first overview about agricultural production in Kazakhstan with regard to natural production conditions and the attitude of farmers towards risk and insurance. Further analyses will focus on the development of appropriate risk management instruments for farms specialised in crop production in the investigated regions.

4 SUMMARY AND CONCLUSIONS

Kazakhstan's agricultural sector plays an important role in the country's economy. Not only does it function as an economic output producer, it also serves as a social buffer in times of transition to a market economy. The restructuring process had a strong impact on the economic performance of agricultural enterprises. The state no longer functions as a back-up financier in times of economic downturn and farmers have to find their own sustainable instruments to manage business risks, risks that are significant in Kazakhstan due to the acute continental climate and the resulting revenue deviations.

The investigation of production conditions, risk attitudes and risk management techniques was a central goal of the discussed farm survey used to specify the requirements of a functioning crop insurance system in Kazakhstan. The first analysis of the data allows to draw the following conclusions:

- A majority of farmers would like to insure their crops in the future.
- A majority would accept deductibles in insurance contracts, whose sustainable rate is about 25 per cent of the insurance sum.
- Besides natural hazards, where drought plays a predominant role in the perception of farmers, changes of prices for inputs and outputs are the major sources of business risk.
- The majority of interviewed farmers vote for a insurance products against risks caused by natural hazards or income insurance.
- Considering the constructed risk aversion index, the respondents can be classified as slightly risk-averse relative to other farmers.
- Risk-aversion and other factors influencing the decision-making process result in different risk-management strategies: Besides the application of risk-reducing technologies and cropping patterns, financial responses like maintaining credit reserves and off-farm employment, production responses, and reduction of costs are relevant risk-management instruments.

For the further research, we can conclude that decision-making conditions and criteria vary across geographic regions and by farm type; thus, subsequent risk models should be adapted to the unique conditions of the research domain because standardized modelling formulations can produce spurious results

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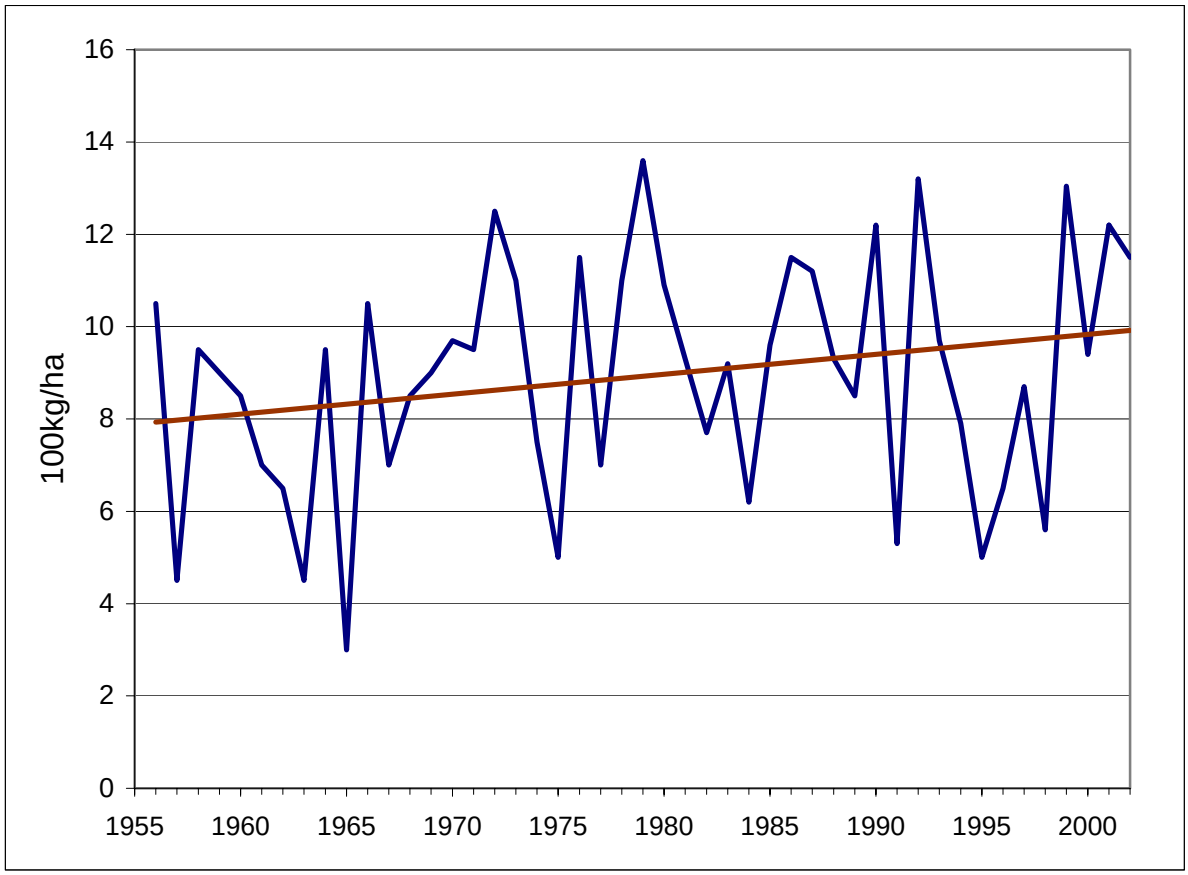
APPENDIX

Appendix 1: Grain yields in Kazakhstan 1955-2002



Source: ROSTANKOWSKI, 1979; PETRICK, 2001; STATISTICAL YEARBOOK OF KAZAKHSTAN, 2003.

Appendix 2: Description of the survey components

Component	Objectives	Respondents	Number of respondents/ participants/ observations	Data character	Date
Structured expert interviews	- To define representative regions relevant for the study - To ascertain most relevant natural hazards, their character and extension - To specify conditions of insurability - To investigate possibilities to avoid principal/agent-problem	Deputies and members of the parliamentary working group on agricultural matters, representatives of insurance companies, scientists, staff of regional agricultural administrations and statistical offices.	13	Questionnaires with experts' responses	2003/09/01-2003/10/01
Workshop	- To inform political decision-makers and involved institutions about main issues regarding introduction of a crop insurance system - To discuss critical questions with respect to the results of the experts' interviews - To select the research regions	Staff of regional departments of agriculture and statistics, staff of insurance and re-insurance companies, members of committee on agrarian issues of majilis (kazakh parliament), researchers, representative of national farmers' union, farmers, representatives of grain trading companies	30	Voting results to the selected questions, discussion results summarised in tables and a protocol	2003/10/02
Farm survey	- To assess farmer's demand for crop insurance - To specify conditions for the farmer's participation in insurance - To define most relevant natural hazards, their character and extension	Farmers and managers of agricultural enterprises	73 (from 15 rayons in 6 oblasts)	Questionares with farmers' responses, accounting data on financial performance of the enterprises and production data focusing on crop production (from 1993 to 2002/2003 in the best case, but strongly varying across farms)	2003/09/15-2003/11/17 and 2004/05/10-2004/07/09

Element/Method	Objectives	Respondents	Number of respondents/ participants/ observations	Data character	Date
Survey of secondary data – meteorological data	- To evaluate weather impact on farm yields and to design weather-based insurance products	–	12 weather stations in five of the six selected oblasts	- Min/Max and average daily temperature, daily precipitation, humidity (time series ranging between beginning of the 20th century and 2003); additionally information on soil moisture (on the 18th of May – beginning of growing period) for two weather stations in Akmola oblast (1974-2003);	2003/09/15-2003/11/17 and 2004/05/10-2004/07/09
Survey of secondary data – production data and other data	- To estimate the magnitude of systemic risk and to design regionally adjusted insurance products - To gain insight into regional production conditions and the actual performance of the regional economies	–	15 rayons (time series from the 1960ies-2002/2003)	- Data on yields and crop areas on the farm level (former sovkhozes/kolkhozes and their largest successors); - Time series data on rayon average yields for the surveyed oblasts; - Additional time series on regional agricultural sectors, regional economic structures, population characteristics…	2003/09/15-2003/11/17 and 2004/05/10-2004/07/09

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KazAU

The Astana Agricultural University (Kazakhstan)

CROP INSURANCE IN KAZAKHSTAN:
Options for Building a Sound Institution Promoting Agricultural Production

On-Farm-Questionnaire

Farm name: _____ Number of questionnaire _____
Farm specialization: _____ Enumerated by _____
Type of enterprise: Date _____

LTD: 32(43.8%),
Individual Farm: 26(35.6%),
Producer Cooperative.: 14(19.2%),
State Enterprise: 1(1.4%)

Rayon: _____
Oblast: _____
Year of Foundation: *Min: 1988, Max: 2003, Mean: 1998*

0.1 How is your crop area assembled?

Former Sowchos/Kolchos	**Area (in ha)**	**Average yield power**	**Year of purchase**
	Min: 3	*Min: 12*	
	Max: 77540	*Max: 66*	
	Mean: 9248	*Mean: 39*	

Confidentiality

This interview is anonymous. Farm data will not be given out to anybody. In the report only numbers of the farms will be mentioned!

1 Personal Data

1.1 Name of the interview partner:_____

1.2 Age: *Min: 33, Max: 70, Mean: 51, St. Dev.: 9.17*

1.3 Telephone number: _____

1.4 Is the farm headed by a manager or is it a family farm?

1. ❑ headed by manager (or group of managers) *29 (40.3%)*
2. ❑ family farm *24 (33.3%)*
3. ❑ other *shareholder* (Please, indicate) *19 (26.4%)*

1.5 What is the highest level of formal schooling / university completed by you? **Code**	1.6 Have you achieved any agricultural education / qualification? **Code**	1.7 Have you taken any additional professional training courses after schooling / higher education **Yes (1)** *39 (53.4%)* **No (0)** *34 (46.6%)*	1.8 How many weeks of training did you receive? **Weeks** *Min: 0* *Max: 156* *Mean: 6.7* *St. Dev.: 19.5*	1.9 What was the subject of the last course you took? **Code**

Codebox for question 1.5

No studies and cannot read or write	0	***1(1.4%)***
No studies but can read or write	1	***0(0.0%)***
Elementary school	2	***1(1.4%)***
Vocational school	3	***1(1.4%)***
Secondary school, gymnasium	4	***9(12.3%)***
Vocational college	5	***8(11.0%)***
M.Sc. studies (university)	6	***51(69.9%)***
Ph.D. studies (university)	7	**-**
Other occupation-specific higher education	8	***2(2.7%)***

Codebox for question 1.9

Languages	1	**-**
Computers	2	**-**
Secretarial	3	**-**
Food processing	4	***2(2.7%)***
Accounting	5	**-**
Management	6	***10(13.7%)***
Other professional: _____	7	***11(15.1%)***
Other: _____	8	***8(11.0%)***
none		***34(46.6%)***

Codebox for question 1.6

None/only practical experience	0	***22(30.0%)***
Only short courses	1	***1(1.4%)***
Agricultural vocational school	2	***2(2.7%)***
Agricultural secondary school	3	***6(8.2%)***
Agricultural university	4	***42(57.5%)***
Post-) Graduate studies	5	**-**

2 General attitude towards crop insurance

2.1 Have you ever been insured?

❏ 1. Yes *23(31.5%)* ❏ 2. No *50(68.5%)*

2.4 Would you like to insure your crop in next future?

❏ 1. Yes *47(64.4%)* ❏ 2. No 26*(35.6%)*

2.4.1 **If No**, why?

❏ 1. Insufficient liquidity (lack of funds)	*1(4.3%)*
❏ 2. You do not believe: insurance can pay off its costs	*8(34.8%)*
❏ 3. You had bad experiences with insurance	*3(13.0%)*
❏ 4. other reasons _____(please indicate)	*5(21.7%)*
❏ 99*	*6(26.1%)*

2.5 What should be introduced to insurance contracts you can take one in?

❏ 1. timing of the contract fulfilment	*33(45.2%)*
❏ 2. sensitivity to changes in weather conditions	*45(61.6%)*
❏ 3. differentiation in regional design of contracts	*18(24.7%)*
❏ 4. a possibility to select a coverage which is reasonable for you	*21(28.8%)*
❏ 5. the premium sum should not exceed *19.2% (μ)* of prod. cost	*19(26.0%)*
❏ 6. other (please indicate): *e.g. insurance contracts should be based on productivity indexes*	*4(5.5%)*

2.6 Would you accept an insurance contract with deductibles?

❏ 1. Yes *49(66.2%)* ❏ 2. No *25(33.8%)*

2.6.1 **If Yes**, how much deductibles can you sustain in average?

❏ 1. 40%	*1(2.1%)*
❏ 2. 35%	-
❏ 3. 30%	*15(31.3%)*
❏ 4. 25%	*4 (8.3%)*
❏ 5. 20%	*18(37.5%)*
❏ 6. 15%	*1(2.1%)*
❏ 7. 10%	*3(6.3%)*
❏ 8. other __ (please indicate)	*6(12.5%)*
❏ 99	*1(2.1%)*

**99=no answer (missing value)*

2.7 Which crops have to be insured in your rayon? Which kinds of risks are to be insured for a particular crop? *(% of total)*

Crop	Price risks (induced by price fluctuations)	Risk of natural hazards (crop failure)	Both (income insurance)
1. Wheat *42(57.7%)**	❑ *3*	❑ *6*	❑ *23*
2. Barley *17(23.3%)*	❑	❑ *9*	❑ *8*
3. Maize *1(1.4%)*	❑	❑ *1*	❑
4. Rice	❑	❑	❑
5. Cotton *16(21.9%)*	❑ *1*	❑ *6*	❑ *9*
6. Sugar beet	❑	❑	❑
7. Sunflower seeds *5(6.8%)*	❑	❑ *4*	❑ *1*
8. Potatoes	❑	❑	❑
9. Melons	❑	❑	❑
10. Grapes *4(5.5%)*	❑	❑ *4*	❑
11. Fruits & berries	❑	❑	❑
12. Green maize	❑	❑	❑
13. Annual ley	❑	❑	❑
14. Perennial ley *1(1.4%)*	❑	❑ *1*	❑
15. other _____	❑	❑	❑

2.8 Which prices would you prefer as reference prices in insurance contracts? Compare prices before evaluating this question)

Crop		in spring (*before-harvest prices*)	in autumn (*after-harvest prices*)
	1. Prices at the commodity-exchange	❑ *12(16.4%)*	❑ *14(19.2%)*
	2. Prices of forward contracts	❑ *4(5.5%)*	❑ *7(9.6%)*
	3. Prices of Food Contract Corporation	❑ *3(4.1%)*	❑ *21(28.2%)*
	4. other _____ (please indicate)	❑ -	❑ -

99: 12(16.4%)

2.10 What kind of crop insurance would you prefer?

- ❑ 1. all-risk insurance (rather expensive) *10(13.7%)*
- ❑ 2. multi-peril insurance (moderate premium costs) *46(63.0%)*
- ❑ 3. against only a particular risk (low premium costs) *9(12.3%)*
- ❑ 99 *8(11.0%)*

2.11 Would you be willing to sign an insurance contract spanning 3-5 years?
❑ 1. Yes *39(53.4%)* ❑ 2. No *34 (46.6%)*

2.12 Please, explain _____

2.13 Do you believe that crop insurance in Kazakhstan must be compulsory?
❑ 1. Yes 27*(37.0%)* ❑ 2. No *27(61.6%) 99: 1(1.4%)*

2.14 Why?_____

2.15 How do you define catastrophe for your enterprise (crop loss in percentage of harvest) (What percentage of crop loss is catastrophic for your enterprise?)
26.5%

3 Weather conditions / natural hazards

3.1 What are the most important natural hazards for your business?

- ❑ 1. Drought *50(68.5%)*
- ❑ 2. Spring Frost (after plant emergence) *15(20.5%)*
- ❑ 3. Early Frost (inducing harvest failure) *10(13.7%)*
- ❑ 4. Wind (sukhovei) *6(8.2%)*
- ❑ 5. Storm *3(4.1%)*
- ❑ 6. Varmints invasion *28(38.4%)*
- ❑ 7. Hail *32(43.8%)*
- ❑ 8. Flood -
- ❑ 9. Winter killing *5(6.8%)*
- ❑ 10. additionally_____(please indicate) *8(11.0%)*
- ❑ 99 *1*

3.2 Please indicate for each of hazards you crossed in 3.1 *(table is analysed for the four most important perils according to question 3.1)*

Natural hazard	**Drought**	**Hail**	**Varmints**	**Spring frost**
3.2.1 Does it have an extensive character? (occurs at several sites at the same time)	❏ 1. Yes ***48(96.0%)*** ❏ 2. No ***1(2.0%)*** ❏ 99 ***1(2.0%)***	❏ 1. Yes ***15(46.9%)*** ❏ 2. No ***15(46.9%)*** ❏ 99 ***2(6.3%)***	❏ 1. Yes ***15(53.6%)*** ❏ 2. No ***8(28.6%)*** ❏ 99 ***5(17.9%)***	❏ 1. Yes ***3(20.0%)*** ❏ 2. No ***12(80.0%)*** ❏ 99 -
3.2.2 What extension does it have? What area does it usually affect?	❏ 1.Oblast ***22(44.0%)*** ❏ 2.Rayon ***22(44.0%)*** ❏ 3.Farms within a radius of < 50 km^2) ***5(10.0%)*** ❏ 99 ***1(2.0%)***	❏ 1. Oblast - ❏ 2. Rayon ***4(12.5%)*** ❏ 3. Farms within a radius of < 50 km^2) ***22(68.8%)*** ❏ 99 ***2(6.3%)***	❏ 1. Oblast ***7(25.0%)*** ❏ 2. Rayon ***5(17.9%)*** ❏ 3. Farms within a radius of < 50 km^2) ***8(28.6%)*** ❏ 99 ***8(28.6%)***	❏ 1. Oblast ***1(6.7%)*** ❏ 2. Rayon ***7(46.7%)*** ❏ 3. Farms within a radius of < 50 km^2) ***5(33.3%)*** ❏ 99 ***2(13.3%)***
3.2.3 How often do you experience this peril during last 20 years ? (e.g.: one time every 5 years?)	***Min: 6/100*** ***Max: 100/100*** ***Mean: 36.5/100*** ***St. Dev.: 19.3/100***	***Min: 5/100*** ***Max: 100/100*** ***Mean: 27.8/100*** ***St. Dev.: 20.1/100***	***Min: 5/100*** ***Max: 100/100*** ***Mean: 59.7/100*** ***St. Dev.: 40.2/100***	***Min: 20/100*** ***Max: 60/100*** ***Mean: 29.5/100*** ***St. Dev.: 13.6/100***
3.2.5 Please indicate, how much crop losses can it induce (in per cent of expected yield)?	***Min: 15*** ***Max: 100*** ***Mean: 57.8*** ***St. Dev.: 19.9***	***Min: 10*** ***Max: 100*** ***Mean: 39.4*** ***St. Dev.: 23.6***	***Min: 15*** ***Max: 100*** ***Mean: 45.3*** ***St. Dev.: 26.2***	***Min: 15*** ***Max: 100*** ***Mean: 55.8*** ***St. Dev.: 30.5***
3.2.6 What kind of risk management measures do you apply to combat negative impacts of this risk?	***Mostly agro-technical methods***	-	***Insecticides***	***Choosing the right sowing period; fumes and water film in grape and fruit production***
3.2.7 Do you see some additional possibilities to address this peril on farm?	❏ 1. Yes ***8(16.0%)*** ❏ 2. No ***41(82.0%)*** ❏ 99 ***1(2.0%)***	❏ 1. Yes - ❏ 2. No ***30(93.8%)*** ❏ 99 ***2(6.3%)***	❏ 1. Yes ***7(25.0%)*** ❏ 2. No ***16(57.1%)*** ❏ 99 ***5(17.9%)***	❏ 1. Yes ***2(13.3%)*** ❏ 2. No ***13(86.7%)*** ❏ 99 -
If Yes, 3.2.8 What kind of possibilities? 3.2.10 How efficient are they? (indicate approximately in per cent how far crop losses can be reduced) 3.2.11 Would you prefer crop insurance to these risk reducing instruments?	***e.g. drought-resistant varieties*** ***Min: 15*** ***Max: 50*** ***Mean: 35*** ***St. Dev.: 12.6*** ❏ 1.Yes ***2(4.0%)*** ❏ 2.No ***47(94.0%)*** ❏ 99 ***1(2.0%)***	- ***Min: -*** ***Max: -*** ***Mean: -*** ***St. Dev.: -*** ❏ 1. Yes - ❏ 2. No ***30(93.8%)*** ❏ 99 ***2(6.3%)***	***e.g. biological pest management*** ***Min: 15*** ***Max: 100*** ***Mean: 53.6*** ***St. Dev.: 33.5*** ❏ 1. Yes - ❏ 2. No ***23(82.1%)*** ❏ 99 ***5(17.9%)***	***e.g. organic fertiliser*** ***Min: 10*** ***Max: 10*** ***Mean: 10*** ***St. Dev.: -*** ❏ 1. Yes - ❏ 2. No ***15 (100%)*** ❏ 99 -

4 Attitudes to risk

The following questions deal largely with your attitudes.
The results in brackets express percentages.

4.1 Please circle the number which best represents your response to the following statements (**questions following a survey in the framework of the research project "An Economic Evaluation of Risk Management Strategies for Agricultural Production Firms." (see Patrick et al., 1985))*

		Strongly Agree		Neutral		Strongly Disagree
1.	"I regard myself as the kind of person who is willing to take a few more risks than others."	**1**	**2**	**3**	**4**	**5**
		42(57.5)	*1(1.4)*	*14(19.2)*	*2(2.7)*	*11(15.1)*
		99: 3(4.1)				
2.	"I must be willing to take a number of risks to be successful."	**1**	**2**	**3**	**4**	**5**
		59(80.8)	*1(1.4)*	*4(5.5)*	-	*6(8.2)*
		99: 3(4.1)				
3.	"I am generally cautious about accepting new ideas."	**1**	**2**	**3**	**4**	**5**
		30(41.1)	*6(8.2)*	*8(11.0)*	*2(2.7)*	*24(32.9)*
		99: 3(4.1)				
4.	"I am reluctant about adopting new ways of doing things until I see them working for people around me."	**1**	**2**	**3**	**4**	**5**
		35(47.9)	*1(1.4)*	*6(8.2)*	*1(1.4)*	*27(37.0)*
		99: 3(4.1)				
5.	"I am more concerned about large loss in my farm operation than missing a substantial gain."	**1**	**2**	**3**	**4**	**5**
		50(68.5)	*1(1.4)*	*1(1.4)*	*1(1.4)*	*16(21.9)*
		99: 4(5.5)				

Mean 1-5: 3.20, St. Dev.: 0.99
Mean 3-5: 2.52, St. Dev.: 1.35

4.2 Assume that a new method of growing cotton (C: n=14) / wheat (W: n=49) (main crop) is developed which results in the same yield every year at no additional cost. Please check the largest percentage of your current expected yield which you would be willing to give up to get the same yield every year.

C: 2(14.3) W: 7(14.3) **0%**	*C: 2(14.3) W: 12(24.5)* **10% or less**	*C: - W: 3(6.1)* **50%**
C: - W: 2(4.1) **2% or less**	*C: 6(42.9) W: 13(26.5)* **20% or less**	*C: - W: 2(4.1)* **90%**
C: 2(14.3) W: 5(10.2) **5% or less**	*C: 2(14.3) W: 5(10.2)* **30% or less**	

Mean C:15.00 , St. Dev. C:10.00
Mean W: 18.14, St. Dev.: 19.69

The next set of questions deals with risk management issues.

4.3 How do you rate the following sources of risk in terms of their importance to your farm decision-making? *Please* ***circle*** *the number which best indicates the answer.*

Sources of Risk	**Importance** Not Important				Very Important
1. Changes in government commodity programmes	**1**	**2**	**3**	**4**	**5**
	5(6.8)	*2(2.7)*	*28(38.4)*	*5(6.8)*	*30(41.1)*
	99: 3(4.1)		***Mean: 3.76, St.Dev.:1.25***		
3. Crop yield variability	**1**	**2**	**3**	**4**	**5**
	9(12.3)	*2(2.7)*	*25(34.2)*	*9(12.3)*	*24(32.9)*
	99: 4(5.5)		***Mean: 3.54 St. Dev. 1.35***		
4. Crop price variability	**1**	**2**	**3**	**4**	**5**
	1(1.4)	-	*10(13.7)*	*5(6.8)*	*53(72.6)*
	99: 4(5.5)		***Mean: 4.58, St. Dev.: .85***		
5. Changes in cost of inputs, such as feed, seed, fuel, machinery repairs, chemicals, custom services	**1**	**2**	**3**	**4**	**5**
	-	-	*16(21.9)*	*4(5.5)*	*50(68.5)*
	99: 3(4.1)		***Mean: 4.49, St. Dev.: .85***		
6. Changes in land rents	**1**	**2**	**3**	**4**	**5**
	14(19.2)	*1(1.4)*	*16(21.9)*	*7(6.9)*	*30(41.1)*
	99: 5(6.9)		***Mean:3.56, St. Dev.: 1.56***		
7. Changes in costs of capital items (e.g., land, machinery)	**1**	**2**	**3**	**4**	**5**
	4(5.5)	*2(2.7)*	*20(27.4)*	*6(8.2)*	*37(50.7)*
	99: 4(5.5)		***Mean: 4.01, St. Dev. 1.22***		
8. Changes in technology	**1**	**2**	**3**	**4**	**5**
	8(11.0)	*3(4.1)*	*21(28.8)*	*12(16.4)*	*26(35.6)*
	99: 3(4.1)		***Mean:3.64, St. Dev. 1.33***		
9. Changes in interest rates	**1**	**2**	**3**	**4**	**5**
	13(17.8)	*4(5.5)*	*19(26.0)*	*9(12.3)*	*25(34.2)*
	99: 3(4.1)		***Mean: 3.41, St. Dev.: 1.49***		
10. Changes in credit availability	**1**	**2**	**3**	**4**	**5**
	8(11.0)	*4(5.5)*	*16(21.9)*	*6(8.2)*	*34(46.6)*
	99: 5(6.8)		***Mean: 3.79, St. Dev.: 1.42***		
11. Other (specify),	*e.g. availability of qualified staff, general political and economic stability*				

4.4 What are your management responses to risk? Consider the list below and indicate the importance of your various responses to risk. *Please **circle** the number which best indicates your answer.*

Risk Management Responses	Importance: Not Important				Very Important
1. Diversification of farming enterprises	**1**	**2**	**3**	**4**	**5**
	14(19.2)	*4(5.5)*	*20(27.4)*	*8(11.0)*	*24(32.9)*
	99: 3(4.1)		***Mean: 2.24, St. Dev.: 1.50***		
2. Geographic dispersion of production	**1**	**2**	**3**	**4**	**5**
	21(28.8)	*7(9.6)*	*21(28.8)*	*5(6.8)*	*16(21.9)*
	99: 3(4.1)		***Mean: 2.83, St. Dev.: 1.51***		
3. Being a low-cost producer	**1**	**2**	**3**	**4**	**5**
	4*(5.5)*	-	*16(21.9)*	*9(12.3)*	*41(56.2)*
	99: 3(4.1)		***Mean: 4.19, St. Dev.: 1.15***		
4. Having back-up management/labour	**1**	**2**	**3**	**4**	**5**
	31(42.5)	*4(5.5)*	*14(19.2)*	*6(8.2)*	*15(20.5)*
	99: 3(4.1)		***Mean: 2.57, St. Dev.: 1.62***		
5. Government farm program participation	**1**	**2**	**3**	**4**	**5**
	17(23.3)	*5(6.8)*	*13(17.8)*	*9(12.3)*	*25(34.2)*
	99: 3(4.1)		***Mean: 3.29, St. Dev.: 1.61***		
6. Forward contracting the selling price of crops	**1**	**2**	**3**	**4**	**5**
	24(32.9)	*1(1.4)*	*23(31.5)*	*10(13.7)*	*12(16.4)*
	99: 3(4.1)		***Mean: 2.79, St. Dev.: 1.48***		
7. Multiple peril crop insurance	**1**	**2**	**3**	**4**	**5**
	11(15.1)	*1(1.4)*	*25(34.2)*	*11(15.1)*	*22(30.1)*
	99: 3(4.1)		***Mean: 3.46, St. Dev.: 1.37***		
8. Hail and fire insurance for crops	**1**	**2**	**3**	**4**	**5**
	13(17.8)	*4(5.5)*	*16(21.9)*	*14(19.2)*	*23(31.5)*
	99: 3(4.1)		***Mean: 3.43, St. Dev.: 1.47***		
9. Life insurance for partners	**1**	**2**	**3**	**4**	**5**
	18(24.7)	*4(5.5)*	*25(34.2)*	*8(11.0)*	*15(20.5)*
	99: 3(4.1)		***Mean: 2.97, St. Dev.: 1.44***		
10. Off-farm investments	**1**	**2**	**3**	**4**	**5**
	41(56.2)	*4(5.5)*	*11(15.1)*	*4(5.5)*	*8(11.0)*
	99: 3(4.1)		***Mean: 2.03, St. Dev.: 1.45***		
11. Off-farm employment	**1**	**2**	**3**	**4**	**5**
	3(4.1)	*1(1.4)*	*19(26.0)*	*10(13.7)*	*37(50.7)*
	99: 3(4.1)		***Mean: 4.10, St. Dev.: 1.12***		
12. Maintaining financial/credit reserves	**1**	**2**	**3**	**4**	**5**
	-	-	*18(24.7)*	*10(13.7)*	*42(57.5)*
	99: 3(4.1)		***Mean: 4.34, St. Dev.: .87***		
13. Debt/leverage management	**1**	**2**	**3**	**4**	**5**
	13(17.8)	*1(1.4)*	*20(27.4)*	*9(12.3)*	*27(37.0)*
	99: 3(4.1)		***Mean: 3.51, St. Dev.: 1.48***		
14. Other (specify)	e.g. *application of new technologies*				

4.5 About which consequences of risk are you most concerned? *Consider the list below and **circle** the number which best indicates your answer.*

	Degree of concern				
	Not Concerned		Very Concerned		
1. Low income	**1**	**2**	**3**	**4**	**5**
	4(5.5)	*1(1.4)*	*23(31.5)*	*11(15.1)*	*31(42.5)*
	99: 3(4.1)		***Mean: 3.91, St. Dev.: 1.16***		
2. Insolvency	**1**	**2**	**3**	**4**	**5**
	20(27.4)	*2(2.7)*	*14(19.2)*	*11(15.1)*	*23(31.5)*
	99: 3(4.1)		***Mean: 3.21, St. Dev.: 1.62***		
3. No credits	**1**	**2**	**3**	**4**	**5**
	25(34.2)	*7(9.6)*	*7(9.6)*	*5(6.8)*	*26(35.6)*
	99: 3(4.1)		***Mean: 3.00, St. Dev.: 1.77***		
4. Loosing job	**1**	**2**	**3**	**4**	**5**
	39(53.4)	*3(4.1)*	*6(8.2)*	*6(8.2)*	*16(21.9)*
	99: 3(4.1)		***Mean: 2.39, St. Dev.: 1.71***		
5. Equity losses	1	**2**	**3**	**4**	**5**
	25(34.2)	*-*	*12(16.4)*	*6(8.2)*	*27(37.0)*
	99: 3(4.1)		***Mean: 3.14, St. Dev.: 1.76***		

4.6 How do you rate your willingness to take risks relative to other farmers? Please give your ratings for your willingness to take risks in farm production, product marketing, farm financial aspects, and in overall farm management. *Please **circle** the number which best indicates your answer.*

	Relative willingness to take risks				
Management Area	Much Less		Much More		
1. Farm production	**1**	**2**	**3**	**4**	**5**
	7(9.6)	*1(1.4)*	*31(42.5)*	*9(12.3)*	*21(28.8)*
	99: 4(5.5)		***Mean: 3.52, St. Dev.: 1.23***		
2. Product marketing	**1**	**2**	**3**	**4**	**5**
	7(9.6)	*4(5.5)*	*33(45.2)*	*4(5.5)*	*22(30.1)*
	99: 3(4.1)		***Mean: 3.43, St. Dev.: 1.27***		
3. Farm finance	**1**	**2**	**3**	**4**	**5**
	10(13.7)	*6(8.2)*	*27(37.0)*	*7(9.6)*	*20(27.4)*
	99: 3(4.1)		***Mean: 3.30, St. Dev.: 1.36***		
4. Overall farm management	1	**2**	**3**	**4**	**5**
	6(8.2)	*3(4.1)*	*31(42.5)*	*7(9.6)*	*22(30.1)*
	99: 4(5.5)		***Mean: 3.52, St. Dev.: 1.23***		

4.7 Please assess the maximum possible and the average yield of the most important crops in your rayon and for your enterprise (unit 100 kg/ha).

Crop	Rayon		Farm	
	Maximum (μ)	*Mean (μ)*	*Maximum (μ)*	*Mean (μ)*
Wheat	18.06	13.06	20.23	12.09
Barley	19.50	13.50	20.60	12.30
Sunflowers	16.20	13.17	14.33	10.22

Thank you very much for your co-operation

5 Questions for the enumerator

5.1 What was the degree of co-operation and interest of the interviewed person?

1. didn't want to co-operate ❑ -
2. had only little interest ❑ *11(15.1%)*
3. were more or less indifferent ❑ *10(13.7%)*
4. had some interest ❑ *27(37.0%)*
5. was very interested ❑ *21(28.8%)*

99: 4 (5.5%), Mean: 3.84, St. Dev.: 1.04

5.2 How well-versed was the person to answer the questions?

1. not well-versed ❑ *13(17.8%)*
2. little well-versed ❑ *21(28.8%)*
3. relatively well-versed ❑ *21(28.8%)*
4. very well-versed ❑ *14(19.2%)*

99: 4(5.5%), Mean: 2.52, St. Dev.: 1.02

5.3 With regard to your experience as enumerator, this enumeration worked…

1. quite bad ❑ *3(4.1%)*
2. worse than normal ❑ *6(8.2%)*
3. normal ❑ *30(41.1%)*
4. better than normal ❑ *11(15.1%)*
5. very good ❑ *19(26.0%)*

99: 4(5.5%), Mean: 3.54, St. Dev.: 1.20

Comments by the enumerator:

Signature:

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