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Poland's agriculture: serious competitor or Europe's poorhouse?
Survey results on farm performance in selected Polish voivodships and
a comparison with German farms

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DISCUSSION PAPER

Institute of Agricultural Development in Central and Eastern Europe

POLAND'S AGRICULTURE: SERIOUS COMPETITOR OR EUROPE'S POORHOUSE?

Survey results on farm performance in selected Polish
voivodships and a comparison with German farms

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ABSTRACT

The aim of this paper is to present an analysis of farm-level data collected in a survey of 464 Polish farms in 2000. Performance indicators of farms in three Polish voivodships are compared with farm accountancy data from two German Länder. The results show that Polish farms were much less profitable than their German counterparts. The gap in income levels is much higher between persons employed in the agricultural sector than between average working persons in the two countries. Living standards within the Polish farm sector decline from the north-west to the south-east. The analysis suggests that the lower profitability of farms is a consequence of pronounced structural deficiencies due to a quite unfavourable workforce-land ratio on Polish farms and hardly a result of lower product prices. Serious technical and economic inefficiencies in the production process become visible in the data. There is a generally conservative attitude among farmers that prefers the continuation of farming over leaving the sector. Nevertheless, income from agriculture is to a substantial extent complemented by off-farm employment in the southern regions. Formal education of farm managers and access to finance appeared not to be crucial for their economic success in the past, although especially the most profitable farms in the north did not obtain as much credit as desired.

Our overall conclusion is that Polish farms currently are in the midst of a regional, economic, and social differentiation process fuelled by huge imbalances in terms of income levels between rural and urban population groups. This process is however seriously slowed down or even halted by a number of effective institutional barriers, particularly with regard to rural labour markets. These barriers should be properly addressed by a formulation of future policies in order to avoid further social frictions in the course of the Polish EU accession.

JEL: Q 12, C 81, P 32.

Keywords: agriculture, farm performance, survey data, Poland, Germany.

ZUSAMMENFASSUNG

Der Beitrag stellt die Ergebnisse einer Analyse von einzelbetrieblichen Kennzahlen vor, die im Rahmen einer Befragung von 464 polnischen Landwirten im Jahre 2000 erhoben wurden. Die Analyse stützt sich auf den Vergleich von landwirtschaftlichen Betrieben in drei polnischen Woiwodschaften und zwei deutschen Bundesländern. Die Ergebnisse zeigen, dass die polnischen Betriebe deutlich geringere Gewinne erzielen als ihre deutschen Vergleichspartner. Der Unterschied im Einkommensniveau zwischen Beschäftigten in der Landwirtschaft ist wesentlich höher als der zwischen durchschnittlichen Arbeitnehmern in beiden Ländern. Das Einkommensniveau innerhalb des polnischen Agrarsektors sinkt vom Nordwesten zum Südosten des Landes. Die Analyse legt nahe, dass die geringere Rentabilität der Betriebe in Polen in erster Linie auf Strukturdefizite als Konsequenz eines ungünstigen Verhältnisses zwischen Arbeitskraftbesatz und Nutzfläche zurückgeht und kein Resultat unterschiedlicher Produktpreisniveaus ist. Die Daten weisen weiterhin auf deutliche technische und wirtschaftliche Ineffizienzen im Produktionsprozess hin. Polnische Landwirte zeigen eine allgemein konservative Haltung, sie ziehen eine Fortsetzung der Tätigkeit als Landwirt einer außerlandwirtschaftlichen Beschäftigung vor. Dennoch werden vor allem in den südlichen Regionen landwirt-

schaftliche Einkommen weithin durch nichtlandwirtschaftliche Einkommensquellen ergänzt. Die formale Ausbildung der Landwirte sowie Zugang zu Krediten erwiesen sich in der Vergangenheit als überwiegend nicht entscheidend für den wirtschaftlichen Erfolg, obwohl besonders die rentabelsten Betriebe im Norden des Landes nicht in der Lage waren, Kredite im gewünschten Umfang zu erhalten.

Wir ziehen als allgemeine Schlussfolgerung, dass sich die polnischen Betriebe inmitten eines regionalen, wirtschaftlichen und sozialen Ausdifferenzierungsprozesses befinden, der in erster Linie durch die großen Unterschiede im Einkommensniveau zwischen ländlichen und städtischen Bevölkerungsgruppen verursacht wird. Allerdings wird dieser Prozess durch effektive institutionelle Hindernisse, besonders im Hinblick auf den ländlichen Arbeitsmarkt, stark verlangsamt oder sogar zum Stehen gebracht. Diesen Hindernissen sollte durch künftige Politikmaßnahmen angemessen begegnet werden, um weitere soziale Verwerfungen im Laufe des polnischen EU Beitritts zu vermeiden.

JEL: Q 12, C 81, P 32.

Schlüsselwörter: Landwirtschaft, einzelbetriebliche Kennzahlen, Befragungsdaten, Polen, Deutschland.

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LIST OF ABBREVIATIONS

AWRSP	Agricultural Property Agency of the State Treasury (Agencja Własności Rolnej Skarbu Państwa)
AWU	Annual Work Unit
BML	German Federal Ministry of Agriculture (Bundesministerium für Ernährung, Landwirtschaft und Forsten)
GUS	Central Statistical Office (Główny Urząd Statystyczny)
IAMO	Institute of Agricultural Development in Central and Eastern Europe
KRUS	Agricultural Social Insurance Scheme (Kasa Rolniczego Ubezpieczenia Społecznego)
LU	Livestock Unit
M-WP	Mecklenburg-West Pomerania
nAWU	non-paid Annual Work Unit
ODR	Extension Centre of Agriculture (Ośrodek Doradztwa Rolniczego)

1 INTRODUCTION¹

In current debates on the EU enlargement process, the role of Poland's agricultural sector is discussed controversially both in the existing member states and in Poland. This is for a number of reasons (see the instructive collection of articles in MILDENBERGER 1999). First, fears loom large among EU farmers that their markets, after accession, will be flooded by cheap products from the East. Due to a much lower price level for some inputs, e.g. labour, Polish farms are assumed to have a distinct cost advantage over their Western competitors. Furthermore, as a consequence of the enlargement process, politicians and bureaucrats are afraid of potential direct payments for a myriad of small and smallest farms in Poland to impose a heavy burden on the EU budget. Polish farmers in turn fear a substantial import pressure as a result of the common market and a buyout of land by Western investors and speculators. Finally, severe social frictions between winners and losers, urban and rural regions within Poland are anticipated due to the perceived backwardness of the farm sector, which accounts for a much higher share of the total population than in most Western economies. Some analysts are afraid that these frictions might trigger a wave of migrants to be poured out on (Western) European labour markets, which is why long-lasting interim regulations for free labour market access are demanded in particular by the German and Austrian governments. All these reasons have led to the widespread belief that the farm sector is one of the major stumbling blocks on Poland's way into the EU (see e.g. BUSSE 2001; SCHMIDT-HÄUER 2000; STYCZEK 2000).

However, *facts* about the situation of Polish agriculture are currently much less widely circulated than *opinions*. While this may be natural in a process of political bargaining, it is in part also due to the uneven and in parts highly fragmented farm structure that existed already during socialist times, and which makes statistical recording a difficult task. Even the Polish government is supposed by some to have no clear picture of its own farm sector (MAGUIRE 2000). Particularly, it is uncertain how many of those Polish citizens who registered as farmers do in fact practice agricultural production or participate in product markets to a significant extent. Due to a number of governmental subsidies (e.g. for the agricultural social insurance scheme KRUS, Kasa Rolniczego Ubezpieczenia Społecznego), there are strong incentives to attain the formal status of a 'farmer' without ever intending to produce anything at all (BACHMANN 1999). Though the results of the latest agricultural census carried out in 1996 shed some light on these issues (GUS 1998b; 1999), they do only provide a limited picture of the actual performance of Polish farms in terms of economic success and accounting results. Generally, there appears to be little information available about this, at least in the non-Polish literature, which forces analysts to rely on highly aggregate data (e.g. WEINGARTEN 1999).

The aim of this paper is to fill, if only in some respects, the existing knowledge gap by providing an analysis of previously unpublished farm-level data collected by the authors in a survey of three former Polish voivodships. The database consists of a random sample of 464 farms of different production structure and organisational forms and allows a very detailed examination of their economic situation. In particular, this information is to a large extent comparable with farm accountancy data collected in EU countries. In the following, we are thus also able to provide a comparison with farm accountancy data of two German regions. A final novelty of the analysis is that the data includes a number of interesting items on the

¹ This paper is an extended version of an article by the same authors forthcoming in *Agrarwirtschaft, Zeitschrift für Betriebswirtschaft, Marktforschung und Agrarpolitik*. The authors wish to thank two anonymous referees of this journal as well as KLAUS FROHBERG, FRAUKE PIRSCHER and PETER WEINGARTEN for helpful comments on earlier versions of this paper. All remaining errors are ours.

farmers' human capital, innovativeness, and access to services, which allows some further-reaching conclusions about their development perspectives.

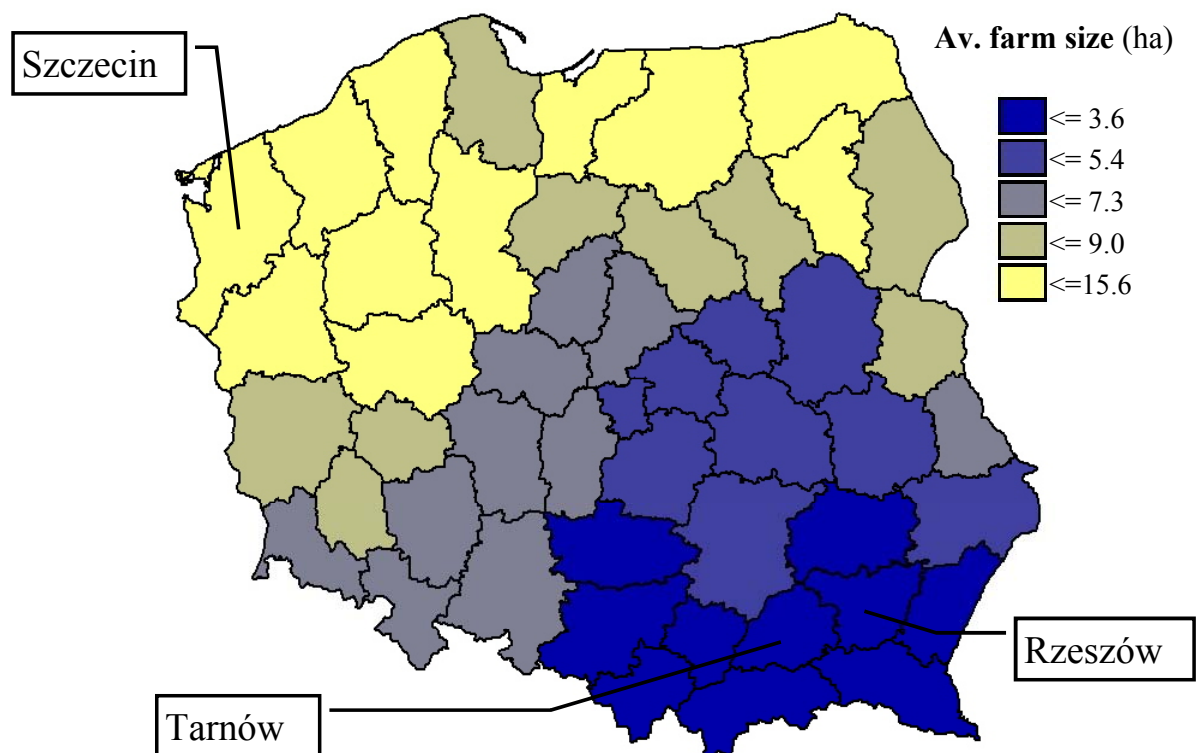
The paper is structured as follows. Chapter 2 gives some more information about the database used for the analysis. Chapter 3 provides a horizontal comparison of economic results between the three Polish regions Szczecin, Tarnów and Rzeszów, and the two German regions Mecklenburg-West Pomerania and Bavaria. Chapter 4 takes a closer look at the development perspectives of Polish farms based on additional information collected in the survey. Chapter 5 summarises the results and draws some conclusions. An appendix explains how the various indicators used in the study were calculated from the survey data.

2 DESCRIPTION OF THE DATABASE

2.1 Background information and sample design

The major data source for the analyses in this paper is the IAMO Poland farm survey 2000, which was carried out as part of the dissertation project of the senior author of this paper. It is a cross-sectional farm survey conducted in the boundaries of the former Szczecin, Tarnów, and Rzeszów voivodships existing prior to the administrative reform of 1. January 1999. The survey was carried out in 2000 and contains mainly data related to the economic outcomes of the year 1999. As Figure 1 shows, Szczecin has very contrary characteristics in terms of farm sizes in comparison to Tarnów and Rzeszów.

Figure 1: Survey regions and average farm sizes in Polish voivodships in 1996



Source: Own depiction based on GUS (1998b).

Mainly due to historical reasons, the organisation and structure of agricultural production in Poland is in fact highly region-specific (this is discussed e.g. in GÓRZ and KUREK 1998, JAKSCH et al. 1997). In the southern and eastern parts of the country, a very small-structured

peasant agriculture predominates, with more than 75% of all farms cultivating less than 5 ha of land (see GUS 1999). In contrast to this, the north and north-west of Poland is characterised by a more diverse farm structure with a higher share of large-scale farms, which is a reflection of the previous importance of state enterprises in agriculture (Państwowe Gospodarstwa Rolne, PGR). Accordingly, the average farm size decreases from the north-west to the south-east of Poland. As a peculiarity for Central and Eastern Europe, under the socialist regime, agriculture in Poland never was completely collectivised. State farms in the north had been mainly established as a result of the re-organisation of former German estates after World War II and administrative land allotment in subsequent years (for detailed analyses see BARCZYK 1962 and PHILIPP 1983). However, after transition to a market economy, these state farms were liquidated or turned into the property of the Agricultural Property Agency of the State Treasury (Agencja Własności Rolnej Skarbu Państwa, AWRSP). This agency in turn sells or leases out the land (for an analysis see e.g. MILCZAREK 2000 and ZIETARA 1995).

As a result of these restructuring processes, the share of agricultural land cultivated by *state-managed farms* in Poland had fallen to less than 8% in 1997 (GUS 1999, p. 9; 1997 is the latest year for which information is available) and its share has presumably further dropped since then. In addition, more than half of the land belonging to state-managed farms was not under cultivation in 1997 (GUS 1999, p. 19), probably mostly due to the apparent dissolution of management structures on these farms or severe economic difficulties. The state-sector thus has completely lost its importance. Within the *private sector*, besides the individual farms (indywidualne gospodarstwa rolne) a number of other forms of farm organisations are considered in the official statistics (GUS 1998b, pp. 166-7). These are 'co-operative farms' (spółdzielnie produkcji rolniczej), 'private companies in home property' (spółki krajowe prywatne), 'other private entities in home property' (pozostałe jednostki własności prywatnej krajowej), 'private entities in foreign ownership' (własność zagraniczna), and 'private entities in mixed ownership' (własność mieszana). These other legal forms are potentially important in terms of absolute numbers only for the North-western regions, where they partly emerged from restructured state farms. However, their exact delimitation from each other is unclear and is further confused by the ongoing changes of ownership status during the past decade. An examination of their internal management structure has shown that it is quite heterogeneous (FEDYSZAK-RADZIEJOWSKA et al. 1999). For these reasons, the survey only distinguished whether a given farm was owner-operated or run by a hired manager, and whether it was in foreign ownership. The survey did not further differentiate legal forms of farms. In the following analysis, legal forms are thus also not distinguished. In general, only farms of the private sector were surveyed.

The survey is based on a random sample of farms in the database of the official extension service ODR (Ośrodek Doradztwa Rolniczego, Extension Centre of Agriculture). This contains roughly one third of all farms identified by the Central Statistical Office (Główny Urząd Statystyczny, GUS), though it is no proper subset of the GUS database on individual farms, since it also contains other organisational forms (see discussion above). In addition, the ODR database consists only of farms that show at least some degree of commercialisation and market integration and that account for the bulk of the traded agricultural produce in the research area. Farms surveyed generally are larger in size than farms identified by GUS (Table 1). The final sample consists of 464 farms; 120 from Szczecin, 108 from Tarnów, and 236 from Rzeszów. Within the given geographic boundaries of the three voivodships, it is a stratified one-stage random sample. In total there are 22 strata, seven forming the Szczecin voivodship, four the Tarnów, and eleven the Rzeszów voivodship. The 22 strata are identical with administrative districts (powiat). Table 1 shows a breakdown of the stratification of the sample on

Table 1: Stratification of survey sample

voivodship	no. of individual farms according to GUS definition	no. of private sector farms in survey frame	no. of farms in frame in % of no. of farms in GUS statistic*	no. of farms in sample	no. of farms in sample in % of no. of farms in frame	av. size of individual farms according to GUS definition (ha)	av. size of farms in sample (ha)
Szczecin	18,888	8,303	43.96	120	1.45	17.5	117.7
Tarnów	53,710	13,356	24.87	108	0.81	3.3	11.3
Rzeszów	115,757	29,627	25.59	236	0.80	3.3	10.9
Sample total	188,355	51,286	27.23	464	0.90	-	28.4
Poland total	2,041,380	-	-	-	-	7.0	-

Note: * Survey frame is no proper subset of GUS database on individual farms, see discussion in text.

Source: GUS statistics according to GUS (1998a); own calculations.

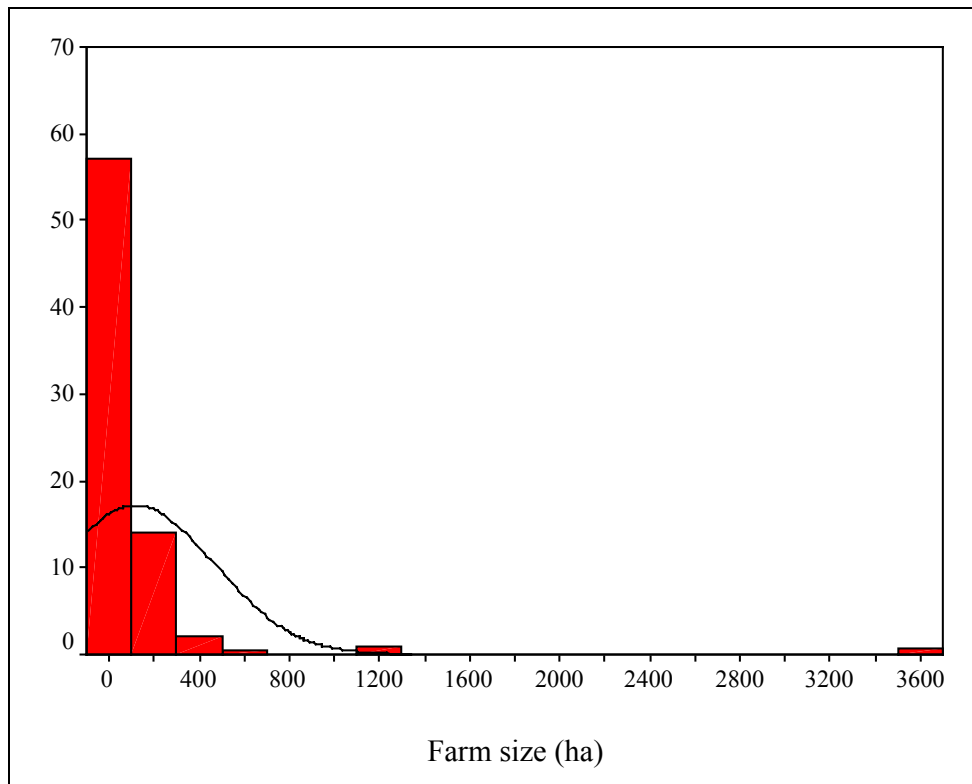
the voivodship level and the relation between the GUS database and the survey frame. Further details on sampling issues, organisation of data collection and a reprint of the questionnaire can be found in PETRICK (2001).

2.2 Some technical details

The horizontal comparison of farm accounting data draws to some extent on the structure of analysis used in the German governmental farm accountancy publications ('Agrarbericht'). A description of the procedures of this farm accountancy analysis and the data for the German regions used for the horizontal comparison is given in BML (2000b). The data of the IAMO Poland farm survey 2000 is based on accountancy results of the single farms visited or, since roughly 60 percent of respondents did not have permanent book-keeping, on estimations of the farm managers. An attempt was made to define single indicators in such a way that a maximum compatibility with the German system was achieved, which was, however, not always possible. As a consequence, only those indicators of the German system are analysed in the following for which Polish data is available from the survey results. An appendix to this paper informs about the exact calculation of the single indicators used and their respective counterpart in the German farm accountancy data system.

The calculations made in the subsequent analyses involve a weighting procedure of the single observations that accounts for the respective proportions of farms drawn in relation to farms in the stratum (see PETRICK 2001).

A specific characteristic of the Polish data-set is that the distributions of many important variables are highly skewed and thus significantly deviate from a normal distribution. Take as an example the distribution of farm sizes in Szczecin voivodship. Figure 2 illustrates the difference between the histogram of observed farm sizes and the displayed course of a normal distribution based on mean and variance of the sample. In the data-set, there are three farms larger than 1000 ha, of which the largest is 3533.0 ha, while roughly half of all observations have farm sizes below 50 ha. The few very large farms, however, drag the mean to 117.7 ha, which is close to the 82% percentile (not shown in the figure). This admittedly rather extreme case shows that the mean may generally not be regarded as an appropriate measure of central tendency. Instead, we prefer the *median*, i.e. the 50% percentile, over the mean, since it is much more robust in the presence of outliers or highly skewed distributions (see DEATON 1997, p. 59). If the skewness of a distribution is less pronounced there is nothing lost, since,

Figure 2: Distribution of observed farm sizes in Szczecin voivodship

N=120	mean	std. deviation	minimum	25 percentile	median	75 percentile	maximum
Farm size (ha)	117.7	349.7	0	31.7	51.4	93.3	3533.0

Notes: Solid line in figure shows a normal distribution based on mean and variance of the sample.

Source: Own calculations based on IAMO Poland farm survey 2000.

for a normal distribution, median and mean are identical. It might be regarded as a further advantage of the median that its value is always actually observed and not virtual as the mean, which might not be a realistic number for any of the observations at all.

The decision to use the median instead of the mean has an important consequence for the analysis of subsequent tables. Since the median is calculated separately for each of the indicators to be analysed, disaggregate indicators usually *do not add up* to the compound value. For example, the given median revenues from plant and livestock production do not add up to the median value of gross revenue stated in the table, though gross revenue is defined as sum of plant and livestock revenues. Of course, they do add up for a single farm observed. The median values reported in the table are, however, most likely to originate from different observations. Throughout the tables, missing values were row-wise excluded. Missing values for farm profit are also the reason for the fact that 25- and 75-quartile subgroup sample sizes are smaller than 25% of the total sample size of a given region.

Monetary statements are made in euro (€), by using the average annual exchange rate for 1999 issued by the National Bank of Poland (which is 1 € = 4.227 zł) and the fixed conversion factor for German marks (1 € = 1.956 DM).

For the statistics on the Polish regions, 1 Annual Work Unit (AWU) equals the labour input of a person employed full time over the whole year. In the survey, this was measured in days,

such that 1 AWU equals 300 working days for agricultural work on the farm and 270 working days for off-farm employment. The abbreviation nAWU denotes non-paid Annual Work Unit (i.e. family labour force). Livestock Units (LU) were calculated according to fixed transformation factors for different types of livestock, for details see appendix.

All German statistics were taken without modification from BML (2000b) (save conversion into €), such that the calculation procedures outlined there apply for this subset of the data. Note that the German statistics are based on the national farm accountancy data network ('Testbetriebsnetz'), which is a panel of farms selected by a quota sampling procedure; it is not a random sample (BML 2000b, p. 110). The statistics shown below only cover full-time farms ('Haupterwerbsbetriebe'), i.e. farms with either more than 1.5 AWU engaged in agriculture per farm or between 0.75 and 1.5 AWU engaged in agriculture *and* a profit contribution to family income of at least 50% (p. 121). Furthermore, they only encompass family farms ('Einzelunternehmen'), i.e. partnerships ('Personengesellschaften') and legal entities ('Juristische Personen') are not included.

3 FARM ACCOUNTANCY DATA: POLISH AND GERMAN REGIONS IN HORIZONTAL COMPARISON

3.1 Introductory remarks

The aim of this section is to assess the economic situation of farms in the IAMO Poland farm survey 2000 sample in comparison with farms of the German farm accountancy data network. There are several reasons why a comparison between Poland and Germany seems to be useful. First, among the current EU member countries, Germany is probably the country closest to Poland in terms of natural conditions, crops under cultivation, and types of livestock kept. Furthermore, the dual farm structure existing in Poland (medium- to large-scale farms in the north-western regions versus small-scale farms in the south-eastern regions, see Figure 1) has its counterpart in Eastern versus Western regions of the reunified Germany. In some sense, on the territory of the former German Democratic Republic, similar problems of agricultural restructuring had to be solved as on the other side of the border in north-western Poland. After a decade of different economic and legal environments, a comparison of these two regions appears to be quite instructive. In fact, the consolidated farm enterprises of Eastern Germany, at least those with a specialisation in crop production, are today assumed to be among the most competitive within the EU (FORSTNER and ISERMAYER 2000). On the other hand, several regions of Western Germany also face problems of a relatively small-scaled agriculture in the midst of structural change, although on a much higher level of economic development as in Poland (see e.g. the analyses in BML 2000a).

As regional counterparts for the three Polish voivodships surveyed we chose the German Länder Mecklenburg-West Pomerania and Bavaria. Mecklenburg-West Pomerania was selected due to its direct neighbourhood to Szczecin voivodship and its to some extent comparable farm structure. Bavaria was chosen since it is among those Länder in Western Germany that struggle most with structural change. Bavaria had the lowest standardised farm income ('Standardbetriebseinkommen') and the smallest average farm size of all Länder in 1999 (BML 2000a, appendix p. 21), which makes it a natural candidate for comparison with the small-structured voivodships Tarnów and Rzeszów in south-eastern Poland.

In this paper, the emphasis lies on the analysis of farm performance. We thus concentrate on indicators that show structure and economic success of single farms. We will generally look at measures of *central tendency* within specified subgroups of the sample. The major analytical

tool throughout the paper is thus the comparison of median and/or mean values. In addition, we will explicitly consider the *distribution* of certain indicators.

The choice of indicators reflects the desire to present an overview of the economic situation of farms as accurate as possible given the data available. The latter constraint was binding in so far that (a) cross country comparisons could only be made for indicators also available from the German accountancy data network and (b) the availability of additional indicators was limited due to the multi-purpose character of the survey (see PETRICK 2001) which naturally could not grant all data wishes. In the present context, this particularly concerns the non-availability of gross margin calculations or other measures of farm internal competitiveness of production activities.

The subsequent analysis will, in turn, discuss indicators on the following items:

- factor endowment of farms,
- the production structure,
- measures of physical output,
- the balance sheet structure,
- investment measures,
- the structure of the profit and loss account,
- profitability indicators, and
- family income measures.

All indicators referred to in the following are listed in Table 2, both for the three Polish voivodships investigated and the two German Länder. Distribution charts are given in Figure 3. Generally, we will regard all five regions jointly and try to highlight important differences or similarities.

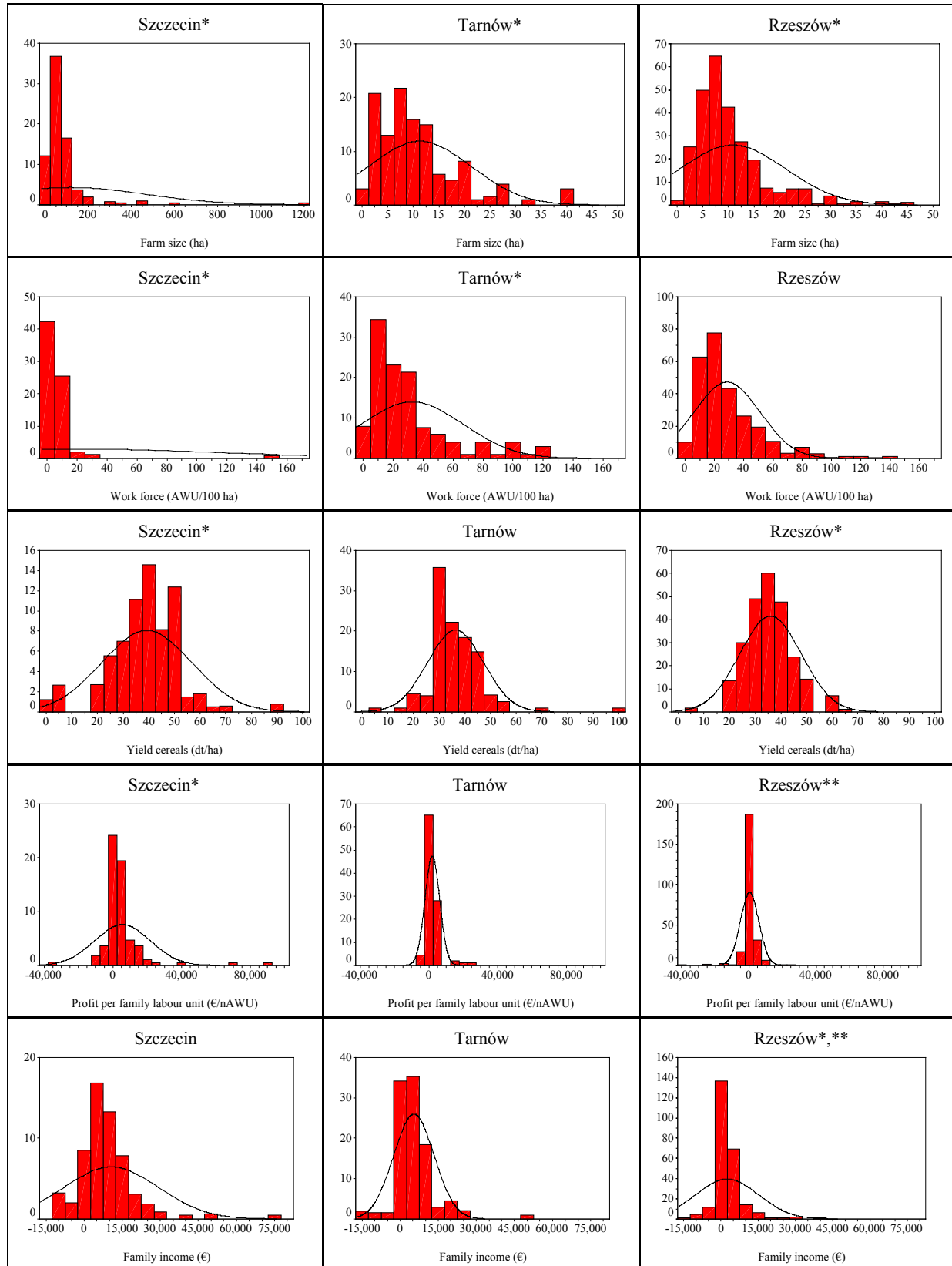
Table 2: Horizontal comparison of farm performance indicators (Poland and Germany) for the cropping year 1998/99

Code Indicator		Unit	Szczecin Median	Tarnów Median	Rzeszów Median	M-WP Mean	Bavaria Mean
10 Farms		No	120	108	236	160	1868
Factor endowment	27 Land rent	€/ha	20	20	20	95	224
	30 Total land cultivated	ha	51.44	8.93	8.24	229.01	36.70
	31 Arable land	ha	47.94	6.90	6.00	185.76	22.49
	32 Pastures	ha	3.97	0.59	1.25	42.72	13.89
	43 Permanent crops	ha	0.00	0.00	0.00	0.19	0.31
	70 Work force	AWU	2.32	2.00	2.00	3.00	1.53
	71 Family work force (nonpaid) Work force per 100 ha	nAWU AWU/100ha	2.00 4.07	2.00 21.71	2.00 21.08	1.50 1.31	1.44 4.17
Production structure	90 Total land cultivated	ha	51.44	8.93	8.24	226.85	35.97
	91 Cereals	ha	32.18	4.00	4.00	108.37	12.32
	96 Sugar beet	ha	0.00	0.00	0.00	6.30	0.92
	130 Livestock	LU/100 ha	19.8	80.7	91.5	37.2	166.0
	131 Cattle	LU/100 ha	0.0	27.5	33.4	28.3	122.1
	132 o.w.: Cows	LU/100 ha	0.0	12.5	20.8	12.6	57.3
134 Hogs	LU/100 ha	5.7	12.8	9.9	6.8	41.5	
Yields	140 Cereals	dt/ha	39.5	34.2	35.0	62.4	62.8
	146 Sugar beet	dt/ha	429.2	434.9	440.0	438.5	654.6
	148 Milk	kg/cow	3678	3000	3000	6130	5559
Balance	200 Fixed assets	€/ha	1537	3104	3640	1716	15605
	201 Land	€/ha	651	650	672	536	11217
	202 Buildings	€/ha	385	1152	1576	470	1899
	204 Machinery and equipment	€/ha	503	1035	1035	632	1335
	214 Livestock	€/ha	33	150	157	225	937
	217 Inventories	€/ha	28	139	149	188	638
	227 Total assets	€/ha	1829	4124	4332	2198	17198
	231 Equity	€/ha	1581	4068	4070	872	15349
	239 Liabilities	€/ha	141	157	115	1262	1744
Inv	251 Gross investment	€/ha	12	18	52	263	573
	267 Net investment	€/ha	-30	-75	-77	76	-396
Profit and Loss	300 Gross revenue	€/ha	467	720	649	856	2243
	301 Plant production	€/ha	304	189	214	489	329
	308 Livestock production	€/ha	160	402	441	363	1744
	385 Input expenditures	€/ha	150	135	145	484	1020
	440 Wage expenditures	€/ha	6	0	0	113	41
	450 Depreciation	€/ha	53	124	147	161	437
	460 Other expenditures	€/ha	80	137	148	293	845
	483 Interest expenditures	€/ha	7	8	7	49	77
	492 Tax expenditures	€/ha	11	15	14	12	18
	501 Profit	€/ha	116	194	109	220	747
	502 Profit	€/nAWU	2552	1256	431	33498	19071
500 Profit	€/farm	5847	2491	943	50304	27410	
Profitability	520 Returns on sales	%	3.0	-34.7	-94.5	5.2	-2.8
	522 Returns on total capital	%	1.7	-5.5	-10.1	5.4	0.0
	524 Returns on equity	%	1.4	-5.0	-12.1	7.9	-0.6
	527 Value added per total work unit	€/AWU	-110	-751	-928	23064	5799
Income	552 Family income	€/family	7593	3869	1612	53486	32284
	561 Profit contribution to family income	%	100.0	79.7	73.7	94.1	84.9

Notes: Code according to BML (2000b). For methodological notes see Chapter 2 and appendix.

Source: Own calculations based on results of IAMO Poland farm survey 2000; BML (2000b).

Figure 3: Distribution charts of selected performance indicators in Szczecin, Tarnów, and Rzeszów voivodships



Notes: Ordinates display number of observations. Solid lines in figures show normal distribution. * maximum (** minimum) value suppressed in figure.

Source: Own calculations based on IAMO Poland farm survey 2000.

3.2 Factor endowment

The analysis of factor endowment – following the systematic of the German farm accountancy data network – includes statements on land rent and the factor stocks of land and labour. The following conclusions can be drawn from the data in Table 2:

- The general observation is that *factor endowments* in Tarnów and Rzeszów are similar, though generally much smaller than in the Szczecin region. Compared with the Polish regions, agriculture in Mecklenburg-West Pomerania (M-WP) can be described as large-scaled, while Bavaria's agriculture appears to be medium-scaled in this context.
- As a consequence, *farm sizes* in Szczecin are – with roughly 50 ha – more than five times larger than those in the southern voivodships. While Bavaria lies between Szczecin and the southern regions with respect to farm size, farm sizes in M-WP exceed even those in Szczecin by more than four times.
- The largest share of total land under cultivation is used as *arable land* in all regions considered. It is relatively most important in Szczecin. Consequently, the importance of *pastures* as a fraction of total farm size is rather small in the Polish regions as compared to the German ones. *Permanent crops* do not play any important role in the Polish median farms.
- *Land rent* in Poland appears to be constant around 20 €/ha, which is one fifth of the value for M-WP and less than one tenth of that for Bavaria. As will be seen below (Section 3.7), also in the light of current profitability of farms on a hectare base, land rents in Poland can be regarded as quite low. Our conjecture is that low land rents in the first place are the result of lacking demand. This may be the case due to a liquidity problem, since funds are widely needed to serve basic income needs of the farm population (see Section 3.8), which appears plausible at least for the southern regions. A second possible explanation is that the value of the *marginal* product of land is in fact widely insufficient to pay land rents. In this case, the question arises why rents do not adjust downwards. Overall, the issue deserves further scrutiny.
- The stock of *labour force per farm* is roughly two AWU in the Polish regions. As a rule of thumb, it is thus two thirds of that in M-WP, while in Bavaria it is two thirds of that in Poland. As a result, the *labour intensity* with respect to land is in Szczecin even lower than in Bavaria, though it is still three times as high as in M-WP. Labour intensity in the southern Polish regions is tremendously higher than in all other regions.

These results can be further extended by looking at the statistical distributions of indicators on the regional level. Histograms on farm sizes and labour intensity for the Polish regions are given in Figure 3. They show that only in Szczecin, there are farms that reach the size of the mean farm in M-WP. In contrast to that, in the southern regions, farm sizes accumulate in intervals below 20 ha. Furthermore, the charts illustrate that there is a particularly wide spread of labour intensities in the southern regions. These figures already point at substantial problems of structural deficits and underemployment in agriculture.

3.3 Structure of production

The structure of production in our analysis consists of the structure of arable land use and the structure of livestock. Based on Table 2, the following observations can be made:

- With regard to the *structure of crop production* the table shows that the share of cereals varies between one third in Bavaria and almost two third in Szczecin. Sugar beet production is of less importance in Poland as compared with Germany.

- There are also substantial regional differences in *livestock density*. In Szczecin voivodship, cattle production is generally of little importance (although there are a number of specialised livestock producers). Hog density is similar to that in M-WP. The southern regions both show higher values for livestock density. Cattle density in the southern regions can be compared with that in M-WP. However, even in the southern regions, cow density is less than half and hog density only around one quarter of that in Bavaria.

In brief, while there are important differences in livestock densities across Polish and German regions, the structure of crop production as represented by the data is more similar.

3.4 Physical output

Measures of physical output concern yields of plant and livestock production. With regard to the statements made in Table 2 and Figure 3, the following can be said:

- With respect to the key products *cereals* and *milk*, the productivity level in the Polish regions is only about one half of that in the German regions, with little differences across Polish regions. Only milk output per cow is slightly higher in Szczecin as compared to the southern regions of Poland. Yields of *sugar beet* in Poland are in the same range as those in M-WP, but only around two thirds of those in Bavaria. Remember that sugar beet production is generally of less importance in the Polish regions observed (see above).
- As would be expected from events largely determined by their natural environment, the charts on cereal yields show that their distribution relatively closely approximates the normal distribution.

Apart from the fact that natural and climatic conditions may be systematically different between Poland and Germany (which seems plausible with regard to plant but not to livestock production), there appear substantial productivity gains yet to be exploited in Poland.

A regional comparison of course should take into account differences in agro-climate and soils. To do justice to this is beyond the scope of this paper. The only tendencies we want at least to mention are that (a) overall differences between Szczecin and M-WP should be comparably small due to their spatial proximity, (b) the same applies to Tarnów as compared with Rzeszów, (c) with regard to average soil quality and rainfall distribution the three Polish regions show no major differences (JAKSCH et al. 1996, pp. 116; 121), and (d) Bavaria is more difficult to compare with the other three regions due to its internal agro-climatic heterogeneity. As a result, at least with regard to M-WP and the three Polish regions, differences in agro-climatic conditions are unlikely to severely bias the comparison of productivity measures.

3.5 Balance structure

The balance structure in Table 2 is given on a €/ha base. It shows the total value of assets and their composition. Note, however, that the median values of single items on the balance shown in the table need not add up to the gross value (see discussion in Section 2.2). The following conclusions can be made:

- In the balance structure, Szczecin has many similarities with M-WP. This includes the *book value of land* on a hectare basis, which is rather constant across Polish regions and even slightly higher than in M-WP. There are two key differences between Szczecin and M-WP. One is the much lower *degree of leverage* in Szczecin (i.e. liabilities in percent of total assets, this is around 8% in Szczecin, in M-WP more than 50%), the other the lower *livestock value* per hectare, which reflects the lower livestock density (see above; it is

however unclear to what extent the mean value for M-WP is biased by few very large livestock producers).

- In the southern regions of Poland, the higher importance of livestock implies a higher *capital stock* per hectare. However, though capital intensity with regard to land is as twice as high as in Szczecin, it is still only one fifth of that in Bavaria. Furthermore, the *degree of leverage* is particularly small in southern Poland (with less than 5%; in Bavaria around 10%).

As a result, in the Polish regions, capital intensities with regard to land are lower in the north and higher in the south, but uniformly much lower than in Bavaria. Furthermore, leverage generally is much lower in Poland than in Germany.

3.6 Investment

With regard to investment, we distinguish gross and net investment per hectare. Net investment is calculated as gross investment minus depreciation.

- *Gross investment* is particularly small in Szczecin. Generally, in Poland, it is only about one twentieth (Szczecin) to one fifth (Rzeszów) of that in M-WP and about one fiftieth to one tenth of that in Bavaria.
- The situation appears to be even more extreme with regard to *net investment*: there is a common tendency of net disinvestment in all Polish regions, which is particularly outstanding in the southern regions. There is however even stronger disinvestment in Bavaria.

Apart from M-WP, agricultural production capacity in all regions concerned was thus shrinking in 1999. In fact, this general observation may only conceal an ongoing process of differentiation into larger, commercial farms on the one hand and smaller ones, with the perspective to exit farming, on the other. In addition, it remains to be seen *what kind of investment* was undertaken by farmers, since substantial funds might have flown into non-productive assets such as residential buildings (see discussion in Section 4.3).

3.7 Profitability

This section examines the profit and loss statements of farms on a per hectare base and a number of derived measures of farm profitability. Table 2 displays the various indicators. These statements can be interpreted as follows:

- *Gross revenue per ha* is smallest in Szczecin, where it is about one half of that in M-WP. The southern regions take a mean position between these two. Bavaria has by far the highest revenue per ha. The latter is due to the importance of livestock production in this region, which earns almost three quarters of total revenue per ha. This structure is similar for the Polish southern regions, although on a much lower level (around one quarter in revenue per ha). In contrast to that, in Szczecin and M-WP, most revenue is generated from crop production.
- *Input expenditures* in Szczecin are only about one third of gross revenue, while they are roughly one half in the German regions. In the southern Polish regions, input expenditures are less than one quarter of gross revenue. Input expenditures thus account for a substantially lower share of revenue in Poland as compared with Germany.
- In comparison with Germany, *wage expenditures* per ha are very low in Szczecin and almost zero in Tarnów and Rzeszów. *Tax expenditures* per ha, however, are roughly similar in all regions concerned.

- Compared with M-WP, Tarnów achieves almost the same values of *profits per ha*, while in Szczecin and Rzeszów it is only about one half. If this is taken as a monetary measure of land productivity, it may indicate some space for efficiency improvements in the latter regions.
- There are substantial differences in *profit per unpaid work unit* in all regions examined: The Polish regions range from 2,552 €/nAWU in Szczecin to only 431 €/nAWU in Rzeszów. Tarnów with 1,256 €/nAWU lies in between. As compared to this, profit per nAWU is 19,071 € in Bavaria and 33,498 € in M-WP. If we compare Szczecin with M-WP and the southern Polish regions with Bavaria, profits per nAWU differ for the first group by a factor of 13, and for the second group by a factor of 20 to 50. The difference is somewhat less pronounced with regard to *profit per farm*, which is caused by the higher labour intensity in Poland.

To put the values for profit per unpaid work unit in perspective, consider the difference in the general wage level in both countries. For Germany we may take the official figures for the salary achieved in industrial occupations ('Gewerblicher Vergleichslohn') presented in the yearly report on agriculture ('Agrarbericht'). In 1999, this annual salary was 26,284 € (BML 2000b, p. 116). A comparison with the average yearly wage for all sectors in Poland in 1999, which is 4,818 € (GUS 2000, p. 158), shows that the off-farm wage in Germany was roughly five times higher than in Poland. A slightly larger difference of 6.4 : 1 obtains if we compare Gross Domestic Product per capita, which was 25,350 US\$ for Germany and 3,990 US\$ for Poland in 1999 (WORLD BANK 2001). In any case, as the previous paragraph sets out, the difference between Germany and Poland in remuneration of labour *in the agricultural sector* was thus substantially higher than in other sectors.

Figure 3 illustrates that the distribution of profit per family labour unit within the Polish regions is rather concentrated around the median, particularly in southern Poland. The previous statements can thus be generalised to be valid for most of the actual farms analysed.

A similar picture of the profitability of agricultural production is drawn by the following indicators of farm performance:

- *Returns on sales* as a measure of profitability after remuneration of unpaid work force in Szczecin is only slightly below the value for M-WP. *Return on capital* and *return on equity*, which both are calculated after family work force has been paid, are worse in Szczecin than in M-WP but at least still positive. In contrast to that, all these figures are deeply negative for the southern Polish regions, and even worse for Rzeszów as compared with Tarnów. However, also Bavarian farms do not yield positive values for these indicators.
- After equity has been paid, *value added per total work unit* is generally negative in the Polish regions under investigation. The implication is that profits are not only insufficient to generate an acceptable income for family labour, but even cannot pay equity the market interest rate.

Hence, although there is a lower relative burden of input and wage costs in Poland, there appears to be an efficiency deficit in the production process on Polish farms expressed by lower profits per ha. A much more substantial difference is however due to the unfavourable man-land relation in Poland which quite negatively affects those indicators that take the remuneration of unpaid labour into account. The general conclusion holds that Polish farmers currently are in a quite difficult economic situation and that there is a huge gap in terms of profit per farm between Germany and Poland.

3.8 Income situation

In our analysis of the income situation of Polish farmers, we investigate the magnitude of income and the share that agricultural production activities contribute. Table 2 and Figure 3 suggest the following:

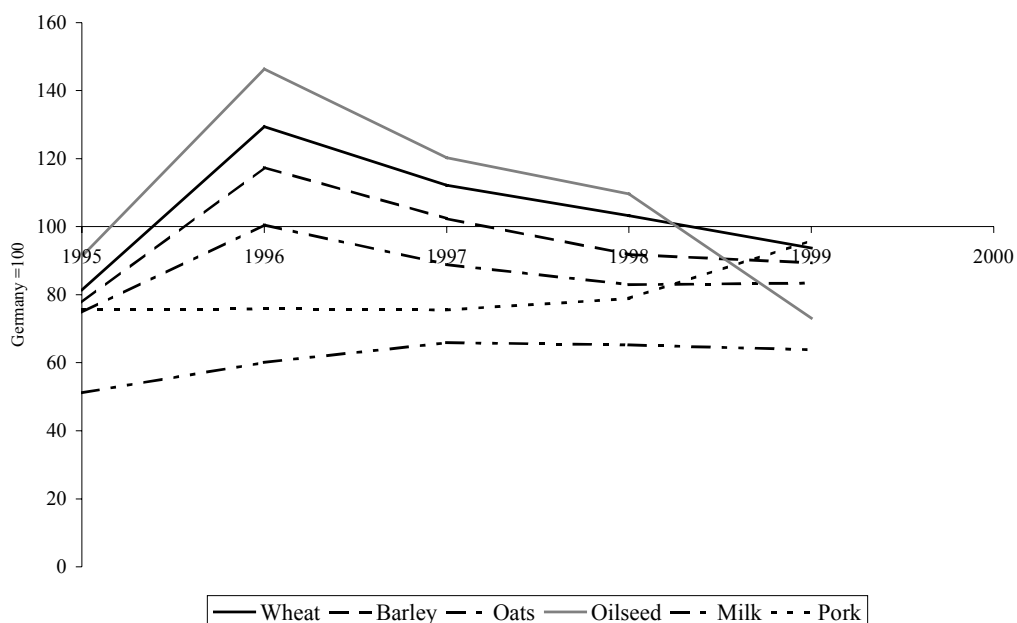
- *Family income* figures differ between Szczecin and M-WP by a factor of around seven, between the southern Polish regions and Bavaria by a factor of around 10 to 15. The distribution charts for the Polish regions show that income levels across households are, with single exemptions, not widely dispersed.
- The *share of off-farm contributions* to family income is higher in the southern Polish regions than in all other regions examined. In Szczecin, the median farm household generates all its income from agriculture. Note, however, that both the Polish and the German sample do not contain those farms with the highest share of income from off-farm employment (namely the smallest and non-commercial farms in Poland and the group of part-time farms ('Nebenerwerbsbetriebe') in Germany).

The difference in income levels between farms in the German regions on the one and Polish regions surveyed on the other hand is thus less dramatic than the profitability gap. However, it is still substantially larger than for the average working person in Germany and Poland.

3.9 A note on prices

The question may arise whether differences in income levels between Poland and Germany are the result of widely varying price levels for agricultural goods in both countries. To investigate this conjecture, Figure 4 illustrates the price development in Poland relative to Germany for a number of important agricultural products in the period 1995 to 1999. We use national average prices since the survey results suggested that there are no major price differences across regions. It becomes clear that prices in Poland by and large converged to those in Germany for that period. Significant differences are displayed for milk, which continuously ranges at about two third of the German reference over recent years, and oilseed, where a re-

Figure 4: Product prices in Poland relative to those in Germany (in %)



Source: Own calculations based on BML (2000c), GUS (1999), and GUS (2000).

markable price disadvantage compared with Germany materialised in 1999.

A differentiated answer to the question is thus necessary. We have seen that cereals production tends to be more important in the north, while livestock production is concentrated in the south (Section 3.3). In fact, the survey results suggest that the most important crop in the north in terms of area under cultivation is wheat, while by far the largest share of revenue from livestock production in the south is generated by the sale of pork. These two products are those with the least difference to Germany. Other important crops such as barley and oats also show an only modest deviation from the German price level. It is therefore fair to say that low product prices cannot be held responsible for the exorbitant profitability gap between Germany and Poland. This is qualified only for those farms that to a substantial extent have engaged in oilseed production in 1999, and generally for those regions where cow density is high, i.e. particularly the southern regions in Poland (Table 2).

Input prices, on the other hand, are likely to be much more heterogeneous as compared with Germany. Particularly land rent, wages and capital costs are likely to differ from those in Germany. However, these prices are implicitly considered in a number of indices presented in Tables 2 to 4. Prices for intermediate inputs such as fertiliser or pesticides or even agricultural machinery are unlikely to be much higher than in Germany, and can hardly be regarded as decisive for the substantial profitability gap between both countries.

3.10 Horizontal comparison between profit groups

In a final step we now look at several subgroups of farms defined by their economic success. Table 3 shows for each Polish region not only the overall median values already reported in Table 2, but also the median values of the least and most successful farms. These latter two groups represent the 25% worst or best farms in terms of profit per farm. It is thus possible to look at the relationship between structural indicators shown in the table and economic success of farms.

Table 3: Farm performance indicators in profit group comparison (Poland) for the cropping year 1998/99

Code	Indicator	Unit	Szczecin			Tarnów			Rzeszów			
			Total	Lowest profit quartile	Highest profit quartile	Total	Lowest profit quartile	Highest profit quartile	Total	Lowest profit quartile	Highest profit quartile	
			Median	Median	Median	Median	Median	Median	Median	Median	Median	Median
10	Farms	No	720	26	26	708	23	23	236	55	55	55
27	Land rent	€/ha	20	21	19	20	20	13	20	24	21	21
30	Total land cultivated	ha	51.44	60.06	121.41	8.93	7.41	12.71	8.24	7.82	11.87	11.87
31	Arable land	ha	47.94	51.13	111.49	6.90	4.51	11.03	6.00	5.50	9.16	9.16
32	Pastures	ha	3.97	3.43	2.97	0.59	0.59	0.57	1.25	1.56	1.21	1.21
43	Permanent crops	ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70	Work force	AWU	2.32	2.95	2.95	2.00	2.00	2.26	2.00	2.00	2.29	2.29
71	Family work force (nonpaid)	nAWU	2.00	1.86	2.00	2.00	2.02	2.00	2.00	1.95	2.27	2.27
	Work force per 100 ha	AWU/100ha	4.07	4.38	2.89	21.71	27.71	17.29	21.08	19.06	16.98	16.98
90	Total land cultivated	ha	51.44	60.06	121.41	8.93	7.41	12.71	8.24	7.82	11.87	11.87
91	Cereals	ha	32.18	30.29	86.25	4.00	3.15	7.16	4.00	3.87	6.60	6.60
96	Sugar beet	ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
130	Livestock	LU/100 ha	19.8	21.8	16.0	80.7	69.0	93.9	91.5	83.9	85.5	85.5
131	Cattle	LU/100 ha	0.0	0.0	0.0	27.5	13.0	28.2	33.4	35.9	19.1	19.1
132	o.w.: Cows	LU/100 ha	0.0	0.0	0.0	12.5	8.0	11.1	20.8	19.5	11.6	11.6
134	Hogs	LU/100 ha	5.7	2.4	3.9	12.8	0.0	26.0	9.9	5.1	23.7	23.7
140	Cereals	dt/ha	39.5	39.5	47.7	34.2	34.1	43.9	35.0	36.4	36.8	36.8
146	Sugar beet	dt/ha	429.2	404.3	400.0	434.9	500.0	400.0	440.0	347.9	438.9	438.9
148	Milk	kg/conv	3678	3961	3671	3000	3000	3500	3000	3000	3750	3750
200	Fixed assets	€/ha	1537	1980	1232	3104	4223	3224	3640	5456	3135	3135
201	Land	€/ha	651	690	709	650	487	772	672	881	672	672
202	Buildings	€/ha	385	553	264	1152	1834	1151	1576	1674	1333	1333
204	Machinery and equipment	€/ha	503	625	328	1035	1774	1072	1035	1536	1015	1015
214	Livestock	€/ha	33	37	13	150	169	160	157	149	204	204
217	Inventories	€/ha	28	31	35	139	133	115	149	148	196	196
227	Total assets	€/ha	1829	2276	1493	4124	4925	4175	4332	6403	4222	4222
231	Equity	€/ha	1581	2125	1208	4068	4733	4105	4070	5751	4064	4064
239	Liabilities	€/ha	141	145	179	157	127	442	115	130	154	154
251	Gross investment	€/ha	12	10	15	18	81	22	52	154	56	56
267	Net investment	€/ha	-30	-46	-10	-75	-134	-83	-77	-74	-60	-60
300	Gross revenue	€/ha	467	363	580	720	382	1428	649	466	1041	1041
301	Plant production	€/ha	304	189	390	189	140	375	214	173	238	238
308	Livestock production	€/ha	160	179	157	402	264	951	441	255	744	744
385	Input expenditures	€/ha	150	148	176	135	118	347	145	145	224	224
440	Wage expenditures	€/ha	6	7	16	0	0	0	0	0	0	0
450	Depreciation	€/ha	53	76	36	124	198	126	147	232	127	127
460	Other expenditures	€/ha	80	106	73	137	188	145	148	184	156	156
483	Interest expenditures	€/ha	7	5	9	8	7	15	7	5	10	10
492	Tax expenditures	€/ha	11	13	11	15	18	17	14	18	13	13
501	Profit	€/ha	116	-39	290	194	-157	866	109	-332	435	435
502	Profit	€/nAWU	2552	-941	11297	1256	-858	4280	431	-1258	2597	2597
500	Profit	€/farm	5847	-1791	21235	2491	-894	9217	943	-2112	5548	5548
520	Returns on sales	%	3.0	-30.4	32.4	-34.7	-278.1	22.7	-94.5	-223.1	-2.0	-2.0
522	Returns on total capital	%	1.7	-6.0	14.5	-5.5	-14.8	7.4	-10.1	-12.3	-0.1	-0.1
524	Returns on equity	%	1.4	-5.0	15.0	-6.3	-15.7	8.1	-12.1	-14.1	-0.5	-0.5
527	Value added per total work unit	€/AWU	-110	-6494	5218	-751	-2908	2488	-928	-4798	487	487
552	Family income	€/family	7593	351	18625	3869	-140	10564	1612	-1475	6310	6310
561	Profit contribution to family income	%	100.0	56.8	100.0	79.7	-35.5	94.5	73.7	-114.7	95.0	95.0

Notes: Code according to BML (2000b). For methodological notes see Chapter 2 and appendix.

Source: Own calculations based on results of IAMO Poland farm survey 2000.

If we go through the table from top to bottom, we are able to observe the following regularities. Within the Polish regions, the more successful farms are those:

- with lower land rents to pay,
- with larger farm sizes,
- with a lower labour intensity with regard to land,
- with a lower (higher) livestock intensity with regard to land in northern (southern) Poland, i.e. a generally higher degree of specialisation,
- with a higher level of physical productivity,
- with a lower capital intensity with regard to land,
- with a higher degree of leverage and higher interest expenditures,
- with a lower degree of disinvestment (exception: Tarnów),
- with higher revenues per ha,
- with a more efficient land use in terms of profit/ha,
- with sufficient profits to pay equity, i.e. positive value added per total work unit,
- with higher family incomes.

In brief, as compared with the average farm, more successful farms are larger, show a lower labour and capital intensity with regard to land, are technically and economically more efficient and more specialised, and are more active on the credit market. These can be regarded as the *conditions* that allow profitable farming in Poland. In most cases there probably exists a mutual reinforcement between profit on the one hand and structural conditions on the other, at least in the longer term (such as with regard to farm size, specialisation, physical productivity, and investment). In those cases, however, where structural parameters are widely exogenous to farm decision making they can be regarded as a direct *cause* of higher farm profits, such as with regard to land rent and labour intensity; in the short term also with regard to farm size and degree of specialisation.

4 FURTHER INDICATORS ON THE DEVELOPMENT POTENTIAL OF POLISH AGRICULTURE

In this chapter, we will examine a number of further indicators that are not usually reported in farm accountancy data analyses. They were, however, included in the IAMO Poland farm survey 2000. In particular, we analyse (Table 4):

- human capital of farm managers, measured as formal education and public engagement,
- innovative behaviour of farm managers expressed in certain indices and future plans,
- the structure of investment activities,
- access to finance,
- the scope of alternative income generation activities, and
- service infrastructure measured as distance to private and public service entities.

Table 4: Further indicators in profit group comparison (Poland) for the cropping year 1998/99

Indicator	Unit	Szczecin			Tarnów			Rzeszów		
		Total	Lowest profit quartile	Highest profit quartile	Total	Lowest profit quartile	Highest profit quartile	Total	Lowest profit quartile	Highest profit quartile
		Frequency or median values	Frequency or median values	Frequency or median values	Frequency or median values	Frequency or median values	Frequency or median values	Frequency or median values	Frequency or median values	Frequency or median values
Farms	No	720	26	26	708	23	23	236	35	35
Not completed primary school	%	0	0	0	0	0	0	1	0	0
Primary school	%	11	9	7	13	4	4	11	6	12
Vocational school	%	42	45	31	43	43	38	49	42	45
Liceum/technical school	%	36	40	25	40	46	56	33	46	39
University	%	11	6	37	8	4	0	7	6	5
Member of coop bank	%	88	93	79	70	50	87	83	72	88
Supervisory board of coop bank	%	6	0	9	1	6	0	1	0	2
Member of credit union	%	2	8	0	3	0	0	5	2	6
Member of other coop	%	23	19	34	34	38	34	22	33	18
Member of rural trade union	%	23	17	25	20	19	46	11	13	14
Delegate of agr. chamber	%	7	3	0	10	13	19	7	4	12
Member of authoritative body	%	13	4	3	14	19	13	12	25	11
Member of political party	%	15	9	15	18	35	23	15	15	15
Index of innovativeness	[0,4]	1	1	1	1	1	2	1	1	2
Index of ex post risk exposure	[0,5]	1	1	0	1	1	1	1	1	1
Index of risk aversion	[0,7]	3	3	3	3	2	3	4	4	3
Increase farm	%	52	56	46	35	32	46	31	29	45
Specialise in certain branches	%	30	38	38	50	32	50	45	35	58
Exit farming and work off-farm	%	7	10	0	8	8	8	10	22	4
Invest in certain assets	%	39	38	37	22	7	42	20	18	30
Pass on farm to next generation	%	26	21	36	23	12	23	37	38	40
Don't plan any changes	%	24	13	25	30	32	17	38	42	28
Land	%*	14.8	11.5	13.5	3.7	6.3	3.8	3.5	2.1	5.3
Residential buildings	%*	13.2	13.8	3.6	25.6	24.3	17.8	17.7	16.4	13.2
Farm buildings	%*	7.4	10.2	7.4	12.0	9.1	19.4	9.1	20.9	19.2
Car	%*	9.5	9.1	10.9	6.7	11.6	11.9	14.3	11.9	15.2
Tractor	%*	18.9	13.7	29.1	17.0	5.4	21.5	8.0	6.0	8.9
Agricultural machinery	%*	21.8	26.0	21.7	7.7	4.4	9.0	10.1	7.3	15.5
Livestock	%*	4.9	6.2	5.1	4.0	2.9	6.0	5.8	9.3	11.1
Personal computer	%*	1.2	1.0	1.4	2.7	2.6	1.8	1.8	1.7	1.1
Modernise telephone network	%*	0.2	0.4	0.0	0.1	1.6	0.1	3.3	2.5	1.6
Modernise heating system	%*	2.6	0.7	5.8	2.1	4.2	0.3	4.0	5.0	1.6
Agrotourism	%*	1.5	0.0	1.3	7.6	12.5	11.4	2.3	1.6	1.5
Other	%*	3.9	7.5	0.5	6.8	11.2	5.3	11.8	15.3	6.0
Applicant unconstrained	%	48	60	50	34	25	44	44	48	55
Applicant partially constrained	%	46	40	50	33	26	39	36	28	40
Applicant fully constrained	%	0	0	0	2	0	0	1	0	2
Non-applicant unconstrained	%	4	0	0	26	45	7	15	20	2
Non-applicant discouraged	%	2	0	0	5	4	4	5	4	2
Agriculture	%*	89	74	99	63	42	87	56	45	77
Off-farm employment	%*	4	9	0	19	34	8	23	35	8
Transfers from...	%*	4	11	0	12	14	3	16	3	10
Non-agr. businesses	%*	3	4	1	2	6	0	2	3	2
Sale of assets	%*	0	0	0	0	0	0	0	0	0
Other	%*	0	1	0	2	4	1	2	2	2
Off-farm income per AWU employed off-farm	€/AWU	994	1126	1126	1013	1291	1302	567	467	628
Households receiving remittances	%	2	3	0	16	26	16	12	10	17
Technical school	km	10	14	15	6	6	8	10	10	8
Bank branch	km	9	10	10	5	3	4	5	4	5
Market place	km	10	10	15	8	6	6	7	7	6
Input supplier	km	8	10	12	4	4	3	5	3	2
Agr. service unit	km	10	15	15	7	6	6	5	5	4
Local administration	km	6	5	8	4	3	4	4	4	5
Extension center	km	12	13	13	6	5	6	6	6	6

Notes: * Mean share in the respective subgroup. For further methodological notes see Chapter 2 and appendix.

Source: Own calculations based on results of IAMO Poland farm survey 2000.

These indicators are believed to be quite relevant for the economic success of agricultural producers and the welfare levels attainable in rural areas not only in the past but also with regard to the future. As such they can be regarded as referring to key preconditions for further development of Polish agriculture. In addition to comparing measures of central tendency as in Chapter 3 we also compare frequencies of responses to closed questions or frequencies of membership in certain categories of respondents. With regard to investment structure and alternative income sources we resorted to mean instead of median values, since otherwise the table would have shown mostly zeros in these rows. As a side-effect, adding-up of row values is guaranteed when using the mean, which eases interpretation in these cases.

4.1 Human capital

Within this section we examine the formal education of farm managers and their public engagement in any kind of social organisation, such as co-operatives, trade unions, or political parties. The following observations can be made from Table 4:

- With regard to *formal education*, there are no marked differences between regions. At best, there is a slightly higher percentage of farm managers with university degree in Szczecin. This appears plausible, since most of the former state farm managers held a university degree. Many of them took over these farms after privatisation. Furthermore, university graduates seem to be particularly concentrated in the highest profit quartile.
- The large majority of farmers is member of a *co-operative bank*. However, only about one quarter to one third of all farmers is also member of *other coops*.
- In the respective regions as a whole, less than a quarter of farmers is engaged in a *rural trade union* or a *political party*. The general degree of political organisation is thus rather low, compared with the usually high levels of membership in farmers' political lobby groups known from EU countries.
- There is however a *systematic relationship between public engagement and economic success* of farms across regions. More successful farmers are less frequently members of coops other than banks or of authoritative bodies (such as the local administration), but are more frequently members of rural trade unions. Membership in banks or political parties appears to have no systematic relation to economic success.

Hence, while there are few differences in formal education, several forms of public engagement coincide with economic success. The direction of causality between success and engagement is, however, difficult to judge.

4.2 Innovative behaviour of farm managers

Innovative behaviour of managers in our analysis includes on the one hand an ex-post assessment of the frequency of innovative activities undertaken together with a measurement of ex-post risk exposure and risk aversion, on the other hand an examination of future plans of farm managers.

The presented *index of innovativeness* counts the number of certain innovative activities undertaken in the years 1997-1999 (such as introduction of a new type of crops). The ordinal scale in the range 0 to 4 counts these events, with 4 as maximal innovativeness. The indices on ex-post risk exposure and risk aversion are constructed in a similar way. *Ex-post risk exposure* counts the number of certain economically hazardous events (such as harvest failure), with 5 as maximal risk exposure. *Risk aversion* is measured as the willingness to pledge cer-

tain assets of personal property as collateral for a bank loan, with 7 as maximal risk aversion. Since these indicators do not have a firm theoretical foundation, they can only be regarded as a heuristic device in order to assess a relative tendency. Note that the formulation of risk aversion does not necessarily rule out risk preference, since no point of risk indifference is defined. The willingness to pledge personal belongings might well be interpreted as an individual risk preference. A major weakness of this measure is however that probabilities of default are not necessarily comparable between respondents. See appendix for further details on these indices.

With these shortcomings in mind, Table 4 allows the following conclusions:

- In relation to the constructed scales, *innovativeness* of farm managers is generally low across regions, the same holds for *ex post risk exposure*. This is not quite in line with intuition: a low risk exposure usually would be expected to allow a more innovative behaviour and vice versa. However, more plausibly, there is a slightly higher innovativeness for the highest profit quartile in Tarnow, and a slightly lower risk exposure for the highest profit quartile in Szczecin.
- *Risk aversion* is generally in the medium range of the given scale. It is slightly higher in Rzeszow voivodship. In general, however, there are no marked differences between regions or profit groups with respect to these indices.
- With regard to *future plans*, the intention to *enlarge* the farm is particularly pronounced in Szczecin voivodship where farm sizes are already bigger than in the other regions. Farmers in the south, to the contrary, are more willing to *specialise* their enterprise. The general readiness to invest is larger in Szczecin as compared with the southern regions, while at the same time comparatively less farmers in the north expressed the attitude that they don't plan any changes at all. There are generally more farmers who want to pass on their farm to the next generation than farmers who intend to exit farming.
- The willingness to increase the farm, to specialise, or to invest in certain assets appears to be positively correlated with profits (with one exception: in Szczecin, farmers with the lowest profits show a slightly higher willingness to invest than those with the highest profits). To the contrary, the desire to exit farming correlates negatively with profits. Furthermore, the intention to pass on the farm to the next generation coincides with higher profits.
- While in Szczecin farmers with the highest profits are those with the lowest intention to change anything on their farm, this relation is reversed in the southern regions. In Tarnów and Rzeszów, farmers with the lowest profits also are those who do not intend to change anything on their farms. Interestingly, in Tarnów, both the highest and lowest profit quartiles show a smaller desire to pass on their farm to the next generation than the total set of farmers.

In summary, given the scales explained above, Polish farmers tend to be conservative, medium risk averse and exposed to risks only to a moderate extent. There is a general attitude among farmers that prefers the continuation of farming (even across generations) over leaving the sector. A substantial share of farmers in the north intends to increase their farms, a substantial share of farmers in the south intends to specialise. However, the farms with the worst economic performance are those with their managers expressing the lowest willingness to change anything on their farms.

4.3 Structure of investment activities

In Section 3.6 we have seen that gross investment levels in all Polish regions are quite low, and that net investment generally is negative. Yet it might be of interest to analyse the structure of investment activities, even if their overall level is low. For this purpose, Table 4 shows the *shares of specific investment activities* in percent of total investment expenses made in 1997-1999. From the table results, the following can be said:

- The main focus of investment differs between the northern and the southern regions. While in Szczecin, farmers invested particularly in *agricultural machinery inclusive tractors and land*, in Tarnów and Rzeszów funds were mainly spent on *residential and farm buildings*. There is thus a tendency in the southern regions to invest in assets that have only secondary value for productive purposes, if they imply any productivity increases at all. This is supported by the fact that expenses on telephone networks ranks much higher in Tarnów and Rzeszów. However, investment in *agrotourism* as an innovative income generation activity has some importance in Tarnów as well. Farmers in Szczecin, on the other hand, appear to be particularly interested in the modernisation and extension of their farming business.
- A general observation is that the more successful farms invest more in *productive assets* (i.e. machinery, farm buildings, land) than the overall median farm. Farms in the lowest profit quartile put very much emphasis on modernising their residential buildings.

All these remarks are qualified by the very low absolute level of investment in general. The overall conclusion of this section however is that the structure of investment activities indicate a process of differentiation dividing the farm population into two broad groups. The first group consists of more or less commercialised *producers* with moderate to good prospects for the future. This group currently tends to be more profitable and is mainly located in the north. The second group includes *stagnating farms* that sooner or later will leave the sector; these farms are currently less profitable and primarily located in the south.

4.4 Access to finance

The survey investigated the single farm's access to finance by directly asking respondents about their experience with bank credit as follows. Credit recipients were asked whether they would have liked to borrow more at the same interest rate. If so, they were classified as '*partially constrained*' borrowers. If their application was rejected at all, they were classified as '*fully constrained*'. Non-applicants were asked if there was a time in the past when they thought of applying for credit but changed their mind because they feared rejection. Those who answered positively were classified as '*discouraged*'. Those who were not discouraged and those who did not want to borrow more than they obtained were classified as '*applicants or non-applicants unconstrained*'. For more details on this methodology and other empirical applications see e.g. FEDER et al. (1989) and MUSHINSKI (1999). Agricultural finance in Poland is the topic of the doctoral thesis of the senior author of this paper, for a further discussion see PETRICK et al. (2001).

Table 4 summarises the central tendency of responses for several subgroups of the sample. The results suggest the following:

- While in Szczecin almost all farmers have *successfully applied* for credit in the previous three years, there is a share of 20% of farmers in Rzeszów and 30% in Tarnów who *did not apply*. Among the non-applicants, the largest share *did not need any credit* at all. Uniformly across regions, of those who applied, a larger share obtained *as much credit as de-*

sired, while a smaller share was *partially constrained*. Generally, there are almost no farmers who were *completely rejected* by the banks.

- In Szczecin, higher profits imply a higher probability to be *partially credit constrained*. The fact that leverage is already higher on the more profitable farms may be an explanation for this. The picture is less clear in the southern regions: Among the high-profit farms, there is both a higher percentage of unconstrained and partially constrained farms, since the share of applicants is higher in general.

It may thus be concluded that access to finance appears not to have been a major bottleneck in the past, though a number of farmers did not obtain as much credit as desired.

4.5 Alternative sources of income generation

In this section, we consider the *composition* of total family income and the *absolute magnitude* of average income from off-farm employment (i.e. off-farm income in short) as the most important non-agricultural income source. Statements in Table 4 on the former are based on farmers' responses regarding the relative shares of various income sources. Values given in the table are thus *mean* shares of the various sample subgroups displayed. Based on this information, the average annual off-farm income was calculated (for details on the methodology to calculate income see PETRICK 2001). In addition, qualitative information about the reception of remittances from abroad is given in the table. The following conclusions can be drawn:

- While in Szczecin *agriculture* accounts for almost 90% of the family income, in the southern regions this is only about 60%. In the latter regions, income from off-farm employment and public transfers play an important role.
- Generally, the *share of income from agriculture* increases with higher profits, while it drops to less than 75% (Szczecin) or 50% (southern) for the low-profit farms. In the southern regions, *off-farm employment* accounts for more than one third of total income for the low-profit farms.
- *Average off-farm income* of the median farm is approximately equal in Szczecin and Tarnów, while it is substantially lower in Rzeszów region. This is, however, still only one fifth (Szczecin and Tarnów) or one eighth (Rzeszów) of the average wage in Poland (all sectors; see Section 3.7 above).
- In Szczecin, the low-profit farms yield a higher *average off-farm income* than the overall median farm in the region, while in the high-profit group no farm has any family member working off-farm at all. This situation is reversed in both of the southern regions, where high-profit farms also tend to yield higher off-farm incomes. However, in Tarnów, low-profit farms earn higher salaries than the overall median.
- *Remittances* have almost no importance in the north, while in both of the southern regions clearly more than 10 percent of the households receive transfers from abroad on a regular base. In Tarnów, a relatively higher share of farms in the less profitable group receives remittances. In Rzeszów, more farms in the higher profit group receive remittances, though in this region differences between groups are less pronounced.

In summary, off farm employment opportunities appear to be particularly important in the southern regions where they constitute a key income source. However, off-farm wages attainable by members of farm households are clearly much lower than those of average working persons in Poland. In other words, although there is a supply of jobs that are substantially higher paid than engagement on farms, the farm labour force usually is not able to get these

jobs and effective opportunity costs are thus very low. Even on the regional level there is thus a highly segmented labour market. We assume that this segmentation is mainly due to individual characteristics such as education or age structure, which is supported by the observation of higher off-farm income per person on the more profitable farms.

The official unemployment rates of relatively modest 10.2% in Małopolska and 14.5% in Podkarpackie voivodships in 1999 (Zachodniopomorskie: 18.1%; national average: 13.1%; see GUS 2000)² do not allow the conclusion that a *lack* of job offers is the only reason for low opportunity costs of the farm labour force. A more plausible reason could be that *in the relevant market segment* (i.e. less sophisticated and with agricultural background) salaries are substantially below the average wage. Nevertheless, in comparison with the national and regional average, remuneration and productivity of the farm workforce is quite low. This is usually labelled as *hidden unemployment*. The comparison reveals that particularly in the south farms in fact 'store' a substantial amount of unproductive labour force. Opposed to that, more profitable farms with an already higher value added per labourer are, due to higher opportunity costs, much more likely to lose a part of their workforce in the future.

Tarnów voivodship is an exception in this respect, since low-profit farms earn higher off-farm salaries than the overall median farm in the voivodship (Table 4). This might indicate that in the low-profit group of farms income pressure has already induced a specialisation with respect to off-farm income generation (in terms e.g. of qualification, intensity of job search, time allocation). In turn, this allows to achieve (and also necessitates) higher salaries than the overall median farm, which receives a still higher share of income from agriculture. An alternative interpretation is that farm households in the lowest profit segment only recently were forced by economic hardships to generate some income from agriculture, though traditionally they are not engaged in farming (WEINGARTEN 1999, p. 12). Their lack of farming experience and their closer relation to the non-farm labour market would then explain their comparatively lower profits from agriculture and higher off-farm salaries.

Remittances are of some importance in the south, where in one region – in the lowest profit group – more than one quarter of all households receives these kind of transfers from abroad. This allows a conclusion regarding migration of farm household members, which obviously must have been taken place in the past. It is not known from the survey data at what time household members migrated and for what reasons. However, the observation of significant reception of remittances especially in the southern regions, and at least for Tarnów with regard to less profitable farms, are in line with the fact that (partly temporal) labour migration has increasingly become important for Polish rural households with lower incomes (see OKÓLSKI 2000 and the references quoted therein).

4.6 Service infrastructure

This section considers the access to public and private services in terms of their distance to the farm-gate. The services included are technical school, bank branch, market place, input supplier, agricultural service unit, local administration, and extension centre (Table 4). The data allows the following statements:

- *Distances to major service units* are generally in the range of 10 km or lower for the overall regional subgroups, which is quite a short distance. In the densely settled southern regions, distances appear to be smaller than in the northern.

² After the administrative reform in Poland, Małopolska includes most parts of former Tarnów voivodship, Podkarpackie includes former Rzeszów, and Zachodniopomorskie includes former Szczecin voivodship.

- Apart from that, the only systematic relationship seems to be that high-profit farms in Szczecin have longer distances to overcome than low-profit farms, which tends to be counterintuitive. However, also for the high-profit farms, distances are still rather small.

The general observation is thus that distance to service units ought to be no serious problem for agricultural producers in Poland, though nothing is said about their quality.

5 FINAL ASSESSMENT AND CONCLUSIONS

The aim of this final chapter is to consolidate the findings of previous sections and to provide an overall assessment of the economic situation and the development potential of farms in three Polish voivodships. The assessment can be done on two levels. On one level we take the *farms in the two German Länder examined as benchmark* and evaluate the Polish accountancy results in their relation to the German standard. On the other level, we look at the different *profit groups within Polish regions* to see what makes farms economically successful. These comparisons allow us by pure inductive logic to derive a number of general statements on the *conditions of success* for Polish farms. They usually do *not* provide an *explanation* of success in the sense of a rigorous cause-effect relation. To obtain this, a much more theoretical approach and the availability of panel data would be necessary.

First, we take the German situation as a benchmark and summarise some general findings of the study. Our comparative analysis of 1999 farm accountancy data allows the following conclusions:

1. Farms in the Polish regions surveyed were *much less profitable* than farms in the two German regions and achieved *much lower levels of income*. While the two countries differed in their overall living standards in terms of average salary of a working person by a factor of five, the remuneration of family labour in agriculture in Germany was about thirteen to fifty times higher than in Poland, depending on the regions compared. Farm household income levels differed by a factor of seven to fifteen.
2. The lower profitability is a consequence of serious *structural deficiencies due to a quite unfavourable workforce-land ratio on Polish farms* and hardly a result of lower product prices. Compared with German counterparts, farm sizes are (still) too small, which is one reason for relatively lower profits per enterprise. Work force intensity in turn is too high, which leads to comparatively low profits per family labour unit. This does not necessarily imply an inefficient labour allocation in the sense that marginal returns on labour input do not equal their effective opportunity costs. Both are assumed to be close to zero, although no empirical data is available for this.
3. *Capital intensity* with regard to land is regarded as too high, since profit (average return) does not suffice to pay equity the market interest rate. This also coincides with our assessment of too small farm sizes given the existing capital stocks. Under the assumption of diminishing returns to capital, marginal returns on capital are even lower than average returns, which for our sample thus implies economic inefficiencies on most farms. Only for some producers, current capital stocks are in an area where capital yields still sufficient (sometimes probably even increasing) returns to size such that further investment is in fact profitable. The very high capital intensity with regard to land found on Bavarian farms may hardly serve as a benchmark, since even in the much more favourable environment there, a sufficient return on capital is not achieved at all. The more promising strategy to improve capital remuneration on farms would thus be to increase land resources. However, currently, most Polish farms in fact disinvest to a large extent.

4. There appear to be further *technical and/or economic inefficiencies in the production process*, since physical yields and profits per ha are substantially lower in Poland as compared with Germany. The latter is hardly the result of differences in agro-climatic and soil conditions, as their variability seems to be not pronounced. Inefficiencies may be due to the use of outdated technology such as machinery or breeding material, and to deficient management skills. It is closely related to the observation that Polish farms are specialised to a much lesser extent than their German counterparts.

These statements are correct if Szczecin is compared with Mecklenburg-West Pomerania. If the southern regions Tarnów and Rzeszów are compared with Bavaria, the same is valid but several times more dramatic, and even worse for Rzeszów as compared with Tarnów. From our comparison of profit groups within regions, a very similar picture can be drawn:

5. The profit group comparison within Polish regions generally *supports the previous assessment*. More profitable farms are larger in terms of land under cultivation, show a lower labour and capital intensity with regard to land, are technically and economically more efficient and more specialised, and, in addition, are more able to receive bank credit.

A novelty of our approach was to include a number of additional indicators of farm performance and development potential into the analysis that are not usually available as standard book keeping data. What kind of additional information do these indicators provide and what does their analysis suggest for the further development of Polish agriculture?

6. A number of general conclusions can be drawn about the behaviour and attitudes of Polish farms. First, farmers were *not very innovative* in the past, and tend to be *medium risk averse*. Second, their *degree of political organisation* is rather low. Third, there is a generally *conservative attitude* among farmers that prefers the continuation of farming (even across generations) over leaving the sector. A sobering finding is that the farms with the worst economic performance are those with their managers expressing the lowest willingness to change anything on their farms.
7. Income from agriculture is to a substantial extent *complemented by off-farm employment* in the southern regions (in some groups one third of total income and more), while agriculture constitutes the bulk of income in the north. However, average *off-farm wages* are generally low as compared with the average wage for all sectors; they are nevertheless higher on high-profit farms.
8. There are remarkable *regional differences* in future plans concerning the development of farms. A substantial share of farmers in the north intends to enlarge their farms by size, while a significant share of farmers in the south intends to specialise into certain branches. However, the general willingness to develop farms appears to be more pronounced in the northern region.
9. With regard to *factors of economic success*, we made the following observations. In contrast to structural deficits mentioned above, the *formal education* of farm managers was not crucial for their economic success, at least not in the southern regions. Furthermore, *access to finance* appears not to have been a major problem in the past, although especially the most profitable farms in the north did not obtain as much credit as desired. Generally, in all regions, all kinds of *public and private service organisations* are usually in easy reach. Remoteness of up- and downstream services thus cannot be regarded as a bottleneck for Polish farmers.

Our overall conclusion is that Polish farms currently are in the midst of a regional, economic, and social differentiation process which is fuelled by the huge imbalance in terms of living

standards between the rural and urban population. This process is however seriously slowed down or even halted by a number of *effective institutional barriers*.

In our mind, the most important barrier to structural change is the *lack of alternative employment opportunities for the current farm population*. Labour productivity is comparatively low both on- and off-farm. The opportunity costs of labour are low, since the average income generated outside agriculture by members of farm households is only one fifth or less of the national average salary, which implies substantial hidden unemployment. We have argued elsewhere that, as long as this situation persists, the agricultural sector will continue to be the labour force buffer of the whole Polish economy (PETRICK and TYRAN 2001).

The problem of lacking alternative employment is reinforced by a perceived conservative and fatalistic or even apathetic *attitude* among a significant proportion of farmers. Many people apparently have accepted their comparatively poor income situation without resistance. They are neither able to leave the sector nor are they willing to change anything in their personal economic environment, given the constraints they face. This coincides with the low degree of political organisation of the farm population. That there are some directions in which farm development could be possible is shown by investments made in agrotourism, as is reported from one of the southern regions.

Further barriers to structural change are in part direct consequences of the difficult situation of the labour market, and in part result from certain government policies. Persistently 'stored' labour force on comparatively inefficient farms with little income generation potential also acts as a regional *land* buffer that impedes the development of commercially oriented farms. Due to this lock-in situation, farm growth so far has been modest. As a result, all but the most profitable farms are forced to generate a substantial share of their income from off-farm sources, which in turn increases the pressure on the labour market.

The market for *capital* is highly distorted by interest subsidies the government grants on agricultural credit, which drives credit interest below the market rate for savings (see PETRICK et al. 2001; PETRICK and TYRAN 2001). These subsidies only to a very limited extent induced investment activities into productive assets, since the general level of investment as compared with Germany is quite low, and net investment is even uniformly negative across regions. Interest subsidies ensure that the relatively low capital remuneration achieved in the agricultural sector appears to be still sufficient to attract bank credit. Consequently, also with regard to capital, the farm sector stores resources that could be used more efficiently in other sectors of the economy.

Any forces that push agricultural structures into an equilibrium that accounts for economy-wide scarcities are thus largely kept in check. Under these circumstances, structural change will only proceed very slowly. Nevertheless, the general direction of this change seems to be already visible. In our opinion, the current set of Polish farms can be divided into two major groups that might be characterised as follows.

The *first group* consists of farms that do have development perspectives as agricultural producers in the long run. This group encompasses farms that are already larger, more efficient and economically better off today. These farms tend to be located in the northern region of Poland, in which case their managers often hold a university degree. In addition, managers of these farms are more motivated to implement changes in their businesses, they are often more active in certain lobby groups, and they stake everything on the development of their farm. However, even before this group lies a major task of structural adjustment in order to catch up with standards set for example by East German farms. Although investment activities within

this group are already directed towards productivity enhancement of farms, the absolute value of investment is still quite low. These farms among the first came up against limiting factors of finance in the past. Therefore, they may be the ones who benefit most from improved private access to EU investment funds in the course of accession.

Farms of this group that are located in south-eastern Poland face even greater challenges, as long as the structural problems of this region are unsolved. A potential development path for them, nevertheless, could lie in a further specialisation or the opening of alternative income sources such as agrotourism or organic farming.³

The *second group* includes stagnating farms that already now are in a difficult economic situation. They are too small to generate sufficient income from agriculture, complementary income sources are thus necessary. Often these farms continue to live on their productive resources, since net investment is deeply negative and funds are often spent more on consumer items than on productive assets. Their medium- to long-term perspective will be to exit the farm sector and generate income from non agricultural activities. A serious impediment to structural change however is that the desire to change anything on the farm is least pronounced in this group. The majority of these farms is presumably located in the south-eastern voivodships of Poland, to find development perspectives for this group represents *the* major structural problem of these regions.

As mentioned in Section 2.1, a huge number of rural households is registered as 'farmers' without producing any significant quantities. Although many of these 'farms' were not included in the IAMO Poland farm survey, most of them presumably also fall under the second group mentioned previously. Stagnant farms therefore are likely to represent the majority of those currently described as individual farms in Poland.

From our analysis, a number of tentative conclusions can be drawn with respect to the issues raised in the first paragraph of the introduction to this paper. In our view, as a consequence of the limited availability of land, but particularly due to the difficult economic situation of many farms in Poland including those in the northern region, there is little scope for a significant expansion of agricultural production after Poland has acceded the EU. With regard to most products, there will be no flood of cheap Polish farm products on EU markets (see also FROHBERG 2001). The precise conditions under which Poland will be integrated into the Common Agricultural Policy (CAP) are of course subject to political bargaining. At the same time, the CAP represents a moving target, since its basic components are currently also under revision. Major amendments may result as a consequence of the midterm review of Agenda 2000. In case that this will imply a further shift away from market regulations and price support, import pressure for Polish agricultural producers in fact may increase. On the other hand, as far as the availability of structural funds as well improves in the course of EU accession, these funds also may tend to conserve the current farm structure, as long as they stock up farm budgets and do not result in improved off-farm employment opportunities.

The extent to which social frictions in Poland will become more visible in the near future is thus largely dependent on the negotiation outcomes. However, a wave of migrants into the EU emerging from collapsed Polish farms is regarded as rather unlikely for two major groups of reasons. First, currently, migration appears already to be a reality for a number of mainly poorer households in the southern regions. In these regions, clearly more than 10 percent of

³ The survey results do not contain any information about organic farming in Poland, which was practised by only 0.03 percent of all farms in 1999. This figure and further background information on organic farming in Poland can be found in METERA (2000).

the surveyed households receive remittances on a regular base, in one group more than 25 percent. Consequently, already today, members of these households are active on Western labour markets. By the way, many of these emigrants do not compete with job-hunting native citizens, since they often serve an entirely different segment of the labour market (mostly low-paid but labour intensive activities in agriculture, catering, nursing and the like, see OKÓLSKI 2000). Second, with regard to the surveyed majority who currently lives in Poland permanently, social adhesion expressed by a widespread absence of a willingness to change living circumstances, the desire to continue farming over generations, and apparently little innovative capacity appear to widely prevent structural change and the potential consequence of emigration. This might be valid to a lesser extent for members of the most economically marginalised and subsistence oriented types of farms that are not covered in this study. However, we still at best expect a slight increase in labour migration after Poland has joined the EU.

Policy makers in Poland and the EU currently face a difficult task. They have to weigh up measures that accelerate structural change for the immediate benefit of few (the most advanced farms of the first group) but imply social hardship for many, against measures that widely paralyse these changes, supposedly avoid the severest hardships, but also do not open perspectives for anybody. It remains to be seen what policy outcomes will be the result of the ongoing accession talks. We hope that this paper has provided more insight into the current situation of the sector and thus helped to pave the way for a more realistic discussion of the complex issues involved.

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**APPENDIX: METHODOLOGY FOR THE CALCULATION OF INDICATORS FROM THE IAMO
POLAND FARM SURVEY DATA**

Indicators used for the horizontal comparison with Germany

Indicator	Explanation or way of calculation from survey data	Notes	Counterpart in 'Agrarberichterstattung' and reference code
Farms	Number of farms in the sample or sample subgroup.	Missing observations were row-wise excluded.	Betriebe (10)
Land rent	$\frac{\text{Total expenses on land rent}}{\text{Total land rented}}$	Average land rent; includes land rented from the AWRSP.	Pachtpreis/ha Pachtfläche (27)
Total land cultivated	Directly taken from questionnaires.		Ldw. genutzte Fläche (30)
Arable land	Directly taken from questionnaires.		Ldw. Ackerfläche (31)
Pastures	Directly taken from questionnaires.		Dauergrünland (32)
Permanent crops	Directly taken from questionnaires.	Includes only orchards.	Dauerkulturfläche (43)
Work force	Sum of working days of household members, relatives, and hired workers divided by 300.		Arbeitskräfte (70)
Family work force (nonpaid)	Sum of working days of household members and relatives divided by 300.		Nicht entlohnte AK (Fam.) (71)
Work force per 100 ha	$\frac{\text{Work force}}{\text{Total land cultivated}} \times 100$		-
Cereals (ha)	Sum of land allocated to wheat, rye, barley, and other cereals production.		Getreide, Körnermais (91)
Sugar beet (ha)	Directly taken from questionnaires.		Zuckerrüben (96)
Livestock	$\frac{\text{Sum of livestock units}}{\text{Total land cultivated}} \times 100$, according to stock at end of the year.	The following transformation factors were used (which partly differ from those used in Agrarberichterstattung due to a higher degree of aggregation): cattle 0.8, cows 1.0, hogs 0.1, sheep 0.08, poultry 0.02, horses 1.0, other 0.5.	Viehbesatz (130)
Cattle	See livestock.	See livestock.	Rinder (131)
Cows	See livestock.	See livestock.	Milchkühe (132)
Hogs	See livestock.	See livestock.	Schweine (134)
Cereals (dt/ha)	$\frac{\text{Quantity harvested cereals}}{\text{Land allocated to cereals}}$		Getreide (140)
Sugar beet (dt/ha)	$\frac{\text{Quantity harvested sugar beet}}{\text{Land allocated to sugar beet}}$		Zuckerrüben (146)

Milk	$\frac{\text{Total production of milk}}{\text{No. of milking cows}}$		Milchleistung (148)
Fixed assets	Sum of stated values of land, buildings, and machinery.	All following values divided by total land cultivated where appropriate.	Anlagevermögen (200)
Land	Directly taken from questionnaires.		Boden (201)
Buildings	Directly taken from questionnaires.		Wirtschaftsgebäude, baul. Anlagen (202)
Machinery and equipment	Directly taken from questionnaires.		Techn. Anlagen u. Maschinen (204)
Livestock	Directly taken from questionnaires.		Tiervermögen (214)
Inventories	Directly taken from questionnaires.	Includes only inventories of farm products.	Umlaufvermögen (217)
Total assets	Sum of fixed assets, livestock, inventories, and other assets as stated in the questionnaire.		Bilanzvermögen insgesamt (227)
Equity	Total assets – total liabilities end of year.		Eigenkapital (231)
Liabilities	Directly taken from questionnaires.		Verbindlichkeiten (239)
Gross investment	Total volume of investment undertaken in 1999 according to statements in questionnaire on single investment activities.		Bruttoinvestitionen (251)
Net investment	Gross investment – Depreciation. Depreciation is calculated as an annual fraction of the stated value of the asset. Only machinery and buildings are depreciated.	Machinery is linearly depreciated over 14 years (i.e. 7% p.a.); buildings are linearly depreciated over 25 years (i.e. 4% p.a.).	Nettoinvestitionen (267)
Gross revenue	Sales revenue from plant and animal products including subsistence production.	Subsistence products are valued with regional average prices if missing. See PETRICK (2001).	Umsatzerlöse (300)
Plant production	Sales revenue from plant products including subsistence production.		Ldw. Pflanzenproduktion (301)
Livestock production	Sales revenue from animal products including subsistence production.		Tierproduktion (308)
Input expenditures	Sum of expenses on seeds, fertiliser, pesticides, hired machinery, and fodder as taken from questionnaires.		Materialaufwand (385)
Wage expenditures	Expenses on wages as stated in the questionnaires.		Personalaufwand (440)
Depreciation	See net investment.		Abschreibungen (450)

Other expenditures	Sum of expenditures on machinery and building maintenance, light and power, fuel, and veterinary services.		Sonstige betriebliche Aufwendungen (460)
Interest expenditures	Directly taken from questionnaires.	Any <i>income</i> from financial assets is ignored.	Finanzergebnis (483)
Tax expenditures	Directly taken from questionnaires.	Usually only land tax.	Steuerergebnis (492)
Profit	Gross revenue – Total expenditures.		Gewinn (500-502)
Returns on sales	$\frac{\text{Profit before taxes - allowance for nonpaid labour}}{\text{Gross revenue}} \times 100$	Allowance for nonpaid labour is 40 zł per day.	Umsatzrentabilität (520)
Returns on total capital	$\frac{\text{Profit before taxes and interest - allowance for nonpaid labour}}{\text{Total assets}} \times 100$		Gesamtkapitalrentabilität (522)
Returns on equity	$\frac{\text{Profit before taxes - allowance for nonpaid labour}}{\text{Equity}} \times 100$		Eigenkapitalrentabilität (524)
Value added per total work unit	$\frac{\text{Profit before taxes + wage expenditures - interest allowance for equity}}{\text{(Total) work force}} \times 100$	Interest allowance for equity is 10% according to annual interest for 12-month deposits.	Gesamtarbeitsertrag (527)
Family income	Sum of all income sources as stated in questionnaire.	For the calculation of income from sources other than agriculture see PETRICK (2001). Negative family income results if total non-agricultural income sources are insufficient to compensate reported losses from agriculture.	Gesamteinkommen (552)
Profit contribution to family income	$\frac{\text{Profit}}{\text{Family income}} \times 100$		Anteil Gewinn am Gesamteinkommen (561)

Additional indicators

Indicator	Explanation or way of calculation from survey data	Notes	Counterpart in 'Agrarberichterstattung' and reference code
Formal education	Frequencies directly taken from statements in questionnaire.		-
Public engagement	Frequencies directly taken from responses to closed questions in questionnaire.	Multiple answers possible.	-
Index of innovativeness	Index counts the positive answers to the following questions: In the previous three years, did you (1) introduce new crops, (2) increase your cropland, (3) introduce a new type of animal, (4) increase the number of animals?	Ordinal scale in the range [0..4].	-
Index of ex-post risk exposure	Index counts the positive answers to the following questions: In the previous three years, did your household experience one of the following events: (1) harvest failure, (2) loss of employment of a family member, (3) severe illness or stay in hospital, (4) flood, hailstorm, fire, (5) loss or theft of machinery?	Ordinal scale in the range [0..5].	-
Index of risk aversion	Index counts the positive answers to the following questions: Would you be willing to pledge the following items as collateral for a bank loan: (1) land, (2) residential building, (3) machinery, (4) car, (5) your monthly income, (6) household assets, (7) harvest?	Ordinal scale in the range [0..7].	-
Future plans	Frequencies directly taken from responses to closed questions in questionnaire.	Multiple answers possible.	-
Investment structure	Share of funds invested in given item in percent of total investment sum of the years 1997-1999. Mean value of shares in the respective subgroup.		-
Credit constraint	Credit recipients were asked whether they would have liked to borrow more at the same interest rate. If so, they were classified as ' <i>partially constrained</i> ' borrowers. If their application was rejected at all, they were classified as ' <i>fully constrained</i> '. Non-applicants were asked if there was a time in the past when they thought of applying for credit but changed their mind because they feared rejection. Those who did were classified as ' <i>discouraged</i> '. Those who were not discouraged and those		-

	who did not want to borrow more than they obtained were classified as 'applicants or non-applicants unconstrained'.		
Income shares	Percentage values directly taken from statements in questionnaire. These are no frequencies.		-
Off-farm income per AWU employed off-farm	Average value of off - farm income of all family members $\frac{\text{total no. of days worked off - farm}}{\text{total no. of days worked off - farm}} \times 270$	Income calculation based on relative income shares (see PETRICK 2001).	-
Remittances	Frequencies directly taken from responses in questionnaire.		-
Distances	Values directly taken from the questionnaires.		-

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