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# Polish Agriculture under Different Policy Scenarios: Impacts on Production and Farm Income

EDWARD MAJEWSKI, LUDGER HINNERS-TOBRÄGEL, SLAWOMIR STRASZEWSKI, ADAM WAS

**Abstract**

**The aim of the paper is to examine impacts of different rates of direct payments on production structures and farm incomes of Polish family farms after the accession to the EU. Analyses have been made for 2004, the assumed year of accession, with the use of a linear programming farm optimisation model. 15 farm types, further differentiated by soil quality, have been selected for the study. The modelling results show, that depending on the respective policy scenario (i.e. the rate of direct payments) the introduction of the Common Agricultural Policy (CAP) in Poland may cause some shifts in farm production. Under the conditions of Agenda 2000 and with 25 % of direct payments, as proposed by the European Commission, farm incomes would in 2004 approximately equate the 2001/2002 base level. However, not all types of farms would benefit from the accession.**

**Keywords: EU accession; Polish Agriculture; direct payments; typical farms; farm model**

**Die polnische Landwirtschaft unter verschiedenen Politikszenarien: Auswirkung auf Produktion und Betriebseinkommen**

**Dieser Beitrag hat eine Untersuchung der Auswirkungen von Direktzahlungen unterschiedlicher Höhe auf Produktionsstruktur und Gewinn landwirtschaftlicher Familienunternehmen in Polen zum Inhalt. Mit Hilfe eines auf linearer Programmierung fußenden Betriebsmodells wird ein Beitritt zur Europäischen Union im Jahr 2004 modelliert. Der Analyse liegen 30 typische Betriebe zugrunde. Die Ergebnisse zeigen, dass bei einer Einführung der Gemeinsamen Agrarpolitik in Polen die Höhe der Direktzahlungen das Produktionsprogramm beeinflusst. Eine Anwendung des Agenda-Szenarios mit Direktzahlungen in Höhe von 25 %, wie von der EU-Kommission vorgeschlagen, führt im Durchschnitt zu ähnlichen Betriebsgewinnen wie im Referenzjahr 2001/2002. Allerdings profitieren nicht alle Betriebstypen von einem Beitritt.**

**Schlüsselwörter: EU-Beitritt; polnische Landwirtschaft; Direktzahlungen; typische Betriebe; Betriebsmodell**

## 1 Introduction

Negotiations on EU enlargement are at the final, decisive stage with the integration of the agricultural sectors of the CEECs and EU Member states still being a major issue. One of the most sensitive problems is the limitation of direct payments as proposed by the European Commission.

Among the arguments, which support the EU negotiation position are budgetary constraints and the fear that direct payments would "impose a heavy burden on the EU budget" (PETRICK et. al., 2002) plus a belief, that CEEC farmers will substantially benefit from price increases through accession, even with reduced direct payments. If the latter is correct, full payments can be considered as over-compensating. The EU stand-point is also strongly supported by the expectation of future CAP reforms, likely to lead to generally reduced direct payments as a consequence of changing policy emphasis and restructured overall support (shifting from the 1st to the 2nd CAP pillar).

Farmers and policy makers in the CEEC commonly raise the issue of unfair treatment, hinting to higher direct payments in the EU-15 likely to undermine the competitive position of agricultural sectors in the candidate countries, as well as reducing the potential financial benefits of integration.

The purpose of this paper is to assist in the debate by presenting up-to-date calculations of likely farm level impacts from introducing the CAP to Polish Agriculture.

In the study six policy scenarios were modelled for the base year (2001/2002) and for 2004, the expected year of the accession:

a. Base scenario: Review of the existing agricultural policy in candidate countries;
b. Non-accession scenario (NAC2004): Assuming there is no accession in the year 2004 and the existing policy is continued;
c. Agenda 0 %: Agenda without direct payments;
d. Agenda 25 %: Agenda with direct payments limited to 25 % of the rate applied in EU Member states, as currently proposed by the Commission;
e. Agenda 40 %: Agenda with direct payments amounting to 40 % of the EU rate;
f. Agenda 100 %: Agenda with the full rate of direct payments, as requested in the negotiation by the candidate countries.

The base scenario reflects the most recent situation on the farms analysed in the study for the year 2001/2002 and serves as a reference for the different policy arrangements.

## 2 Methodology

The method used is based upon a farm income optimisation model (MAJEWSKI et. al., 1996; BERG, DAVIES, MAJEWSKI, 1999). The basic assumptions are presented here.

Analyses have been made for 30 typical Polish farms (two sets of farm types with 15 farms each, on good and on poor soil, respectively). For all policy scenarios two variants of the model solutions were generated:

a) No-change variant: Farm profits in 2004 are estimated assuming no change from the base year in both, crop and livestock production. The argument for this calcualtion is, that between the base year (2002) and the target year (2004), there will be no time for significant changes to take place except for the imposed introduction of the set-aside scheme.
b) Optimisation variant: The estimates of farm income are adjusted for changes in cropping and stocking as a result of the new incentives in each of the policy scenarios. In view of the short time interval between the base year and the target year any changes were constrained to 20 % of the existing size of activities. Although therefore not fully optimised, the model solutions indicate possible re-

actions of farmers to the policies introduced through accession.

The basic assumptions made for modelling include the following:

*a) Policy scenarios*

- The base scenario reflects the existing agricultural policy and the market situation. Direct payments for bread quality wheat and rye, subsidies to fuel purchases and social security payments were calculated;
- For the Agenda scenarios the CAP measures were applied as currently operated by EU Member states, however, some modifications specific to the candidate country have been made (table 1).

Table 1: **Basic policy measures for 2004 Agenda scenarios**

| Measures and assumptions | Poland |
|---|---|
| Direct payments | 0 %, 25 %, 40 % and 100 % of the EU rates depending on the scenario |
| Reference yield | 2,96 t/ha of cereals and oilseeds* |
| Set-aside: Minimum<br>Maximum | 10 % (0 % in Agenda without payments)<br>20 % |
| Livestock payments: cattle | Beef special premium, slaughter premium |
| Sugar quota | Existing level |
| Milk Quota level | Estimates for single farm type at the level of the milk quota proposed for Poland by the Commission |
| Milk quota leasing price | 20 % of milk price |

* The European Commission negotiation position.

*b) Price and costs assumptions*

Although prices of the main agricultural commodities vary between countries, even within the EU, it is assumed that prices in the candidate states will tend to reach the EU levels due to harmonization. For a number of products present prices in Poland do not significantly differ from those in the EU. It is expected, however, that for different reasons, e.g. the market situation (latent oversupply) or low quality, the prices of some products will be lower, even below intervention prices for eligible commodities (table 2).

Table 2: **Farm gate prices of main cash crops and animal products** (in €/dt) **– base year prices and assumptions for 2004 Agenda scenarios**

| Product | Year 2001/2002 | Year 2004 |
|---|---|---|
| Winter wheat | 11.5 | 11 |
| Barley | 9.5 | 9.5 |
| Rye | 8.0 | 8.5 |
| Cereals mix | 7.0 | 7.0 |
| Corn | 8.8 | 8.8 |
| Oil-seed rape | 21.5 | 21.5 |
| Sugar beets | 2.78 | 3.55 |
| Potatoes | 10 | 10 |
| Beef | 75 | 98 |
| Pork | 98 | 91 |
| Milk | 21 | 23 |

*Sources*: GUS (2001), farm survey data, own estimates.

It is also assumed that input prices and production costs will tend to match EU levels. For Poland in particular German input prices and costs could be used as a reference. Initial (2001/2002) Polish inputs prices were generally lower, although, for instance, prices of pesticides were almost equal. The authors' estimate is that in Poland there will be a 10–20 % increase in energy, fertilizer and veterinary costs during the next few years. However, the expected harmonization of prices and costs will not fully have eliminated the existing gap by 2004 because of – to a large extent – lower labour costs and less advanced technologies used in Polish Agriculture.

Prices of selected inputs as applied in models are presented in table 3.

Table 3: **Prices of selected inputs – Base year prices and assumptions for 2004 Agenda scenarios**

| Inputs | Year 2001/2002 | Year 2004 |
|---|---|---|
| Grains for feed (€/dt) | 9 | 9 |
| Corn (€/dt) | 8.8 | 8.8 |
| Compound for pigs (€/dt) | 18 | 16 |
| Compound for cattle (€/dt) | 15 | 14.3 |
| Compound for cows (€/dt) | 17 | 16 |
| Nitrogen (€/dt) | 40 | 48 |
| Diesel oil (€/l) | 0.62* | 0.72 |
| Monthly wages (€/person) | 375** | 450 |

* price without the subsidy (ca. 20 % of retail price). – ** cost of permanent hired labour – social security and health care payments (ca.48 %) included

Sources: GUS (2001), farm survey data, own estimates

It was assumed that fixed costs in the models for the year 2004 will be the same as in the base year of 2001/2002.

*c) Productivity and Gross Margins*

The levels of yields and average gross margins for selected commodities are shown in table 4 (crop production) and table 5 (livestock).

In the models yields were differentiated according to technologies specific to farm types. This resulted in different gross margins after the necessary adjustments in the input level were made. These differences in gross margin calculations also reflect the real evidence from farming practice in Poland: specialized, large farms are often able to realize advances on the prices of some commodities. Such farms achieve higher prices due to usually higher qualities and larger quantities of products offered for sale. Furthermore, it was decided to use constant base year levels of productivity in crop and livestock production for all 2004 scenarios assuming that a two years' time is too short to achieve a significant change of yields, even though long term trends indicate yield increases.

Gross margins for cash crops were calculated as the difference between the value of production and variable costs, with the latter containing the values of the following inputs: seeds, fertilizers, pesticides, tractor (fuel, oil and maintenance costs) and machinery variable costs (estimated at 50 % of tractor costs) and combine cost at the level of contracting prices. Variable costs of fodder crops were calculated in a similar manner.

In the gross margin calculations for livestock production variable costs deducted from revenues were feed (compound feed and farm produced grains at market prices), cow (sow) replacement, veterinary costs, water supply.

It should be emphasized, that the gross margins are for information only, they were not, as such, used for optimi-

sation. Instead, the individual parameters used in the gross margin calculation were fed into the model.

Table 4: **Yields** (t/ha) **and gross margins or variable costs** (negative sign) **for selected crops** (€/ha), without direct payments

| Items | Yields dt/ha* | | Gross margin or variable costs (€/ha) | | | |
|---|---|---|---|---|---|---|
| | | | Base (2001/2002) | | Agenda 2004 (estimate) | |
| Farming System<br>Soils | Intensive<br>Good | Extensive<br>Poor | Intens.<br>Good | Extens.<br>Poor | Intens.<br>Good | Extens.<br>Poor |
| Commodities: | | | | | | |
| Winter Wheat** | 51.8–63.3 | – | 299 | –*** | 264 | – |
| Fodder Wheat | 49–59 | – | 237 | – | 229 | – |
| Barley | 43.5–53 | – | 295 | – | 288 | – |
| Triticale | – | 16.2–19.8 | – | 78 | – | 74 |
| Rye | – | 14.4–17.6 | – | 53 | – | 59 |
| Corn | 45–55 | – | 147 | – | 137 | – |
| Peas | 27–33 | – | 82 | – | 80 | – |
| Lupinus | – | 9–11 | – | 61 | – | 61 |
| Oil-seed rape | 22.8–27.9 | – | 408 | – | 395 | – |
| Starch Potatoes | 324–396 | 144–176 | 504 | 182 | 494 | 176 |
| Ware Potatoes | 288–352 | 126–154 | 813 | 292 | 804 | 287 |
| Sugar Beets | 466–569 | – | 829 | – | 1198 | – |
| Fodder Beets | 495–605 | 306–374 | –455 | –369 | –469 | –378 |
| Maize | 550–600 | – | –302 | – | –317 | – |
| Lucerne | 468–572 | – | –98 | – | –98 | – |
| Grass | 495–605 | 234–286 | –199 | –130 | –218 | –142 |
| Permanent Grassland | 405–495 | 171–209 | –125 | –67 | –139 | –75 |

* Range, depending on scale of production and technology level. – ** Bread quality. – *** Not grown on specific type of soil.

Table 5**. Livestock productivity characteristics**

| Item | Intensive farms, good soils | Extensive farms, poor soils |
|---|---|---|
| Milk yield litres/cow | 3700 – 7000 | 3300 – 6300 |
| Number of piglets from 1 sow per year | 18 – 21 | 18 – 21 |
| Gross margin – dairy cow: | (milk yield: 5200 l) | (milk yield: 4300 l) |
| Base year | 814 | 561 |
| Agenda 2004 | 925 | 653 |
| Gross margin – sow with fatteners: | | |
| Base year | 496 | 361 |
| Agenda 2004 | 262 | 197 |
| Sources: farm survey data, own assumptions | | |

The objective function in the model was maximizing farm income, calculated according to the standard definition in the farm accounts data network of the EU (Commission of the European Cummunities, 1989).

*d) Farm types selected for modelling*

There are many features of Polish agriculture, making any analysis of the farming sector very complex. These include spatially differentiated farming conditions in terms of climate and soil quality, a large number of farms within a wide range of farm sizes, varied technologies, all of which produce great heterogeneity of farms. It was estimated that 210 farm types would represent about 90 % of the whole agricultural sector in Poland (MAJEWSKI et al., 2002). According to those estimates the 30 farm types selected for this study represent about 18 % of all farms with more than 2 hectares of agricultural land, and about 40 % of all agricultural land.

Given this partial representation it was decided to illustrate the widest impact of policy changes by conducting analyses for two sets of farms with extreme farming conditions and intensity of production level. The sample considered therefore consists of 15 intensive farms on good soil and, on the opposite, 15 extensive farms on poor quality soil. It should be emphasized that poor soils (5th and 6th class at the six grade scale) make up more than 30 % of total agricultural land (RADECKI et al., 1999, p. 31), whilst good quality soils amount to about 10 % of the total. Highly intensive farms are mostly viable under any policy environment and dominate agriculture in regions with good farming conditions. Extensive farms, by contrast, dominate in regions with poor quality soils, and are highly dependent on support.

Models constructed for all selected farm types were mainly based on detailed descriptions of real farms from a sample of over 700 commercial farms surveyed in 1998 (MAJEWSKI, 2001). For reasons of model simplification some adjustments were made in the base year production structure (eg. removing activities of marginal importance). Parameters were compiled from surveyed farms as well as from normative data, in order to achieve a higher degree of uniformity of model assumptions, free of individual farm specific irregularities. Therefore, model solutions are considered to be, to a large extent, representative of the respective farm types.

Farm types selected for modeling for this study are listed in table 6.

Table 6. **Characteristics of the set of Polish farm types selected for modelling**

| Farm type number | Farm type | Agric.-land (ha) | Number of cows/ sows | Farm type number | Farm type | Agric. land (ha) | Number of cows/ sows |
|---|---|---|---|---|---|---|---|
| | Good soils | | | | Poor soils | | |
| 1D | Dairy | 3 | 3/0 | 1D | Dairy | 3 | 1/0 |
| 2D | Dairy | 19 | 8/0 | 2D | Dairy | 18 | 8/0 |
| 3D | Dairy | 58 | 27/0 | 3D | Dairy | 55 | 30/0 |
| 4D | Dairy* | 525 | 132/0 | 4D | Dairy* | 499 | 165/0 |
| 5P | Pig | 6 | 0/0** | 5P | Pig | 6 | 0/1 |
| 6P | Pig | 17 | 0/4 | 6P | Pig | 16 | 0/4 |
| 7P | Pig | 34 | 0/13 | 7P | Pig | 32 | 0/14 |
| 8P | Pig* | 315 | 0/66 | 8P | Pig* | 299 | 0/71 |
| 9A | Arable | 7 | – | 9A | Arable | 7 | – |
| 10A | Arable | 55 | – | 9A | Arable | 52 | – |
| 11A | Arable* | 735 | – | 9A | Arable* | 698 | – |
| 12M | Mixed | 6 | 1/2 | 10M | Mixed | 6 | 2/2 |
| 13M | Mixed | 18 | 5/3 | 11M | Mixed | 17 | 8/5 |
| 14M | Mixed | 12 | 2/8 | 12M | Mixed | 11 | 3/9 |
| 15M | Mixed | 33 | 11/8 | 13M | Mixed | 31 | 13/9 |

* Family farms with hired labour. – ** Farm with fatteners raised from purchased piglets.

## 3 Modelling results

The main objective of the study was to assess the farm level financial impacts of introducing the Common Agricultural Policy to Polish agriculture with the different payment schemes examined. The model solutions also showed potential changes in crop and livestock production structures for different policy scenarios and variants.

The financial impacts of different policy scenarios have been measured by estimated farm income. In the paper, it is shown for each farm type. Shifts in production structures are illustrated with the aggregated mean figures for the whole subset of farm types. Weighted averages are calculated on the basis of the authors' own estimates of the number of farms in Polish agriculture represented by specific farm types and their shares in the use of agricultural land.

### 3.1 Crop and livestock production structure

The cropping structure is presented for two clusters of farm types: farms on good soil and those on poor quality soil in diagrams 1 and 2.

In the "No change" modelling variant, the cropping structure for the base scenario and for the Agenda with no direct payments (Agenda 0 %) scenario, is exactly the same. It was assumed that in the Agenda 0 % scenario, where farmers in candidate countries are not eligible for direct payments, the set-aside scheme will also not apply.

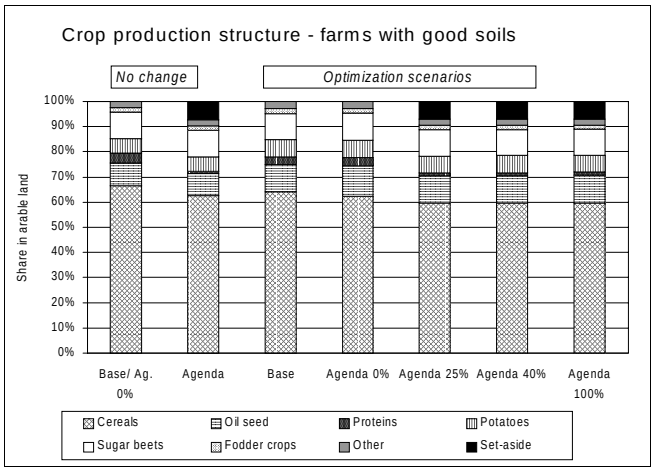


**Diagram 1**

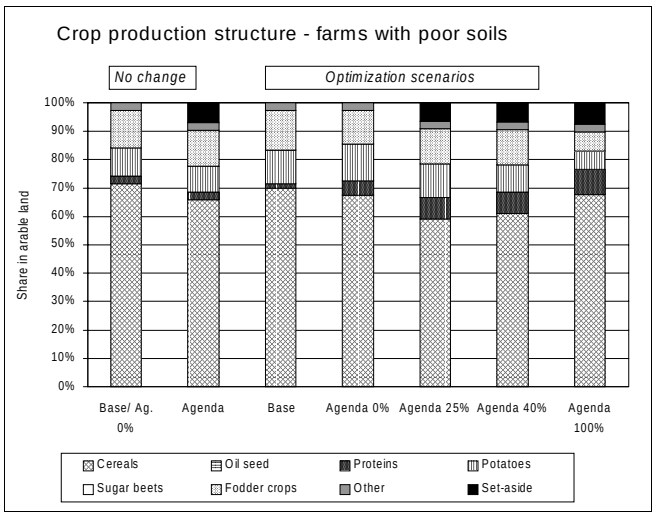


**Diagram 2**

Cropping patterns in all other Agenda scenarios (listed on the diagram as "Agenda") differ from the Base and Agenda 0 % models – for farm types on good soils with the introduced set-aside (7,2 % on average) and a reduced share of cereals and protein crops by 2,9 percentage points each (cereals from 66,5 % to 62,6 %, protein crops from 3,7 % to 0,8). Less noticeable was the decrease of share of oil-seed rape and fodder crops. There is a slightly smaller area of fodder crops, although there is no change in cattle numbers, which is explained by changes in the pattern of crops selected by the model in favour of higher yielding, though more costly activities. The sizes and shares of the most profitable root crops were not affected by the set-aside requirement. Similar patterns of adjustments characterize farms on poor soil, although the main source of the set-aside area (6,9 % on average) is cereals (5,7 %), with smaller contributions from potatoes and fodder crops (0,6 % each).

Bigger changes in the cropping structure characterise solutions for farm types with good and poor soils in the "optimisation" variant.

Optimisation for farms on good soil results in a larger decrease in the share of cereals (up to 6.8 % compared with the base – "no change" scenario) and a small reduction in the share of protein crops (between 0,4 % and 2,5 % depending on the Agenda scenario) and fodder crops (between 0,2 % and 0,5 %). Optimisation models, when allowed to increase the extent of activities by 20 % at most, raised the share of oil-seed rape by up to 2,4 % and potatoes by 1 %. The optimal cropping pattern for all Agenda scenarios was almost independent of the level of direct payments, however, the Agenda 100 % scenarios showed higher shares of oil-seed rape and protein crops.

Differences in the level of direct payments in the Agenda scenarios had more significant impacts on the cropping patterns of farms on poor soil. Whilst under base and Agenda 0 % scenarios optimal solutions were very similar to the initial, "no change" situation, with a small increase of the share of potatoes and protein crops, the introduction of payments caused some more noticeable shifts in the optimal structure of production. To a large extent such changes were driven by set-aside. Models for Agenda scenarios with a 25 % or 40 % rate of payments favoured potatoes and protein crops, reducing the area of cereals to 60 % of arable land. This is because low yielding cereals supported by small payments are hardly profitable. After increasing payments to the 100 % rate cereals and protein crops become much more attractive. High area payments result in a significant reduction of potatoes as well as of fodder crops, the latter because of changes in livestock production.

Analysis of model results reveals, that optimisation of farm production under all Agenda scenarios and within the limits determined by the modelling assumptions leads to noticeable changes in the livestock sector as compared with both, the base – "no change" and base – "optimal" variants (diagrams 3 and 4).

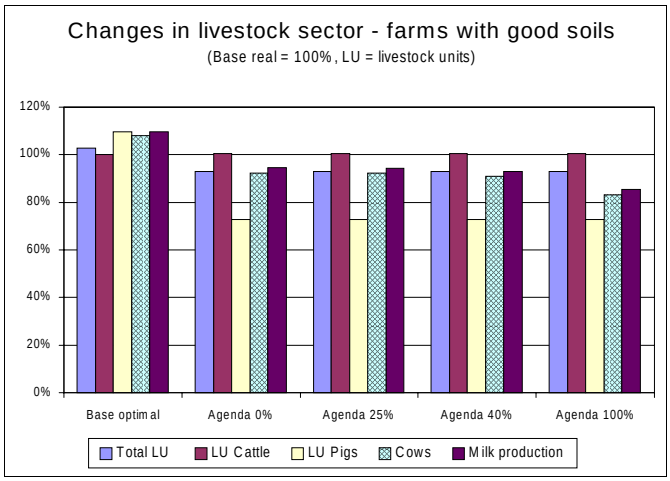


**Diagram 3**

Optimal solutions generated for the base scenario to some extent show increased livestock density, raising pig and milk production by about 5–7 percentage points. But for the assumptions of all Agenda scenarios, the optimisation mod-

els reduce the size of animal production below the base scenario level, with the exception of beef cattle on farms on poor soil. The most radical changes in livestock production are caused in the optimal variant by introducing full rate direct payments (Agenda 100 %), which strongly favour crop production at the cost of the livestock sector.

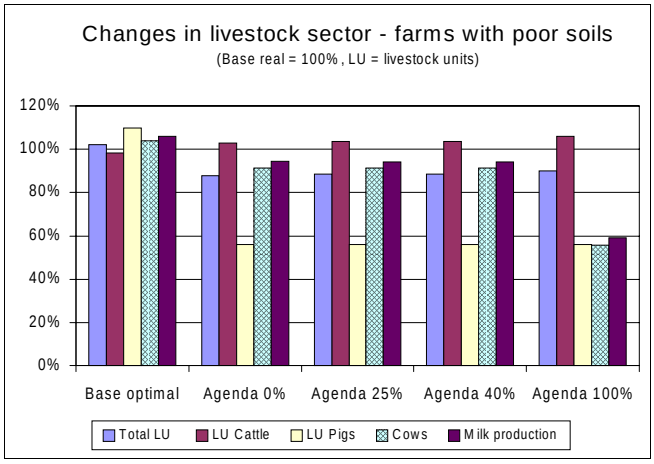


**Diagram 4**

The most significant change is a drop in the number of pigs, mainly due to the fall of pig meat prices assumed for the year 2004.

The diagrams show clearly that the pattern of changes in animal production is almost the same whether the farms operate on good or on poor soil.

It might be objected, that introducing any of the Agenda scenarios may indeed produce such radical changes in livestock production. Taking such objections seriously, one could admit that some price assumptions might later be corrected by reality or that farmers may not fully react to the policy signals. However, modelling results indicate at least possible trends of changes in the production pattern of Polish farms after accession, and these trends will almost certainly represent a group of farmers, if not considerable shares.

### 3.2 Financial results

The impacts on farm incomes resulting from different agricultural policy scenarios are shown in tables 7 and 8.

An additional policy scenario is presented here, assuming Poland would not join the EU in the year 2004 (no accession scenario – „NAC 2004"). Since crop and livestock production was nearly the same as for the base "no change" and the base „optimal" scenarios, this scenario has not been discussed for simplicity in the previous chapter.

The general observation is that, when compared to the base year situation, the average farm income[1]) with "no accession" and Agenda 0 % scenario was lower in 2004. Agenda with 25 % of payments brings farm incomes back to base year levels. Direct payments at the 40 % rate would noticeably improve the financial situation of farmers, while the Agenda 100 % scenario would boost farm incomes to significantly high levels. These relations hold for farms on good soil as well as on poor soil and are valid for both variants of modelling (no change as well as optimisation). Optimisation of production increases the farm income. Under Agenda 25 %, on average, the increase of farm incomes would exceed 40 % in relation to the "no-change" variant. This indicates the incentive for farms to adjust to the new policy environment. For different reasons, such as farmers' resistance to changes, market constraints or simply lack of sufficient information on the new agricultural policy implications, it is difficult to expect, however, that such a big increase will be widespread in the first years after the accession.

Table 7: **Farm income** (€) **under different policy scenarios – "no change" variant – 2004**

| Farm type | Farm size (ha) | Base 2001/02 | NAC 2004 | A0% | A25% | A40% | A100% |
|---|---|---|---|---|---|---|---|
| **Good soils** | | | | | | | |
| Dairy | 3 | –72 | –228 | –145 | –9 | 79 | 433 |
| Dairy | 19 | 2124 | 1609 | 2180 | 3185 | 3719 | 6078 |
| Dairy | 58 | 19537 | 18089 | 2101 | 24246 | 26139 | 34436 |
| Dairy | 525 | 140955 | 130945 | 151865 | 166241 | 180549 | 242272 |
| Pig | 6 | –441 | –667 | –712 | –557 | –465 | –94 |
| Pig | 17 | 1638 | 757 | 492 | 1062 | 1404 | 2773 |
| Pig | 34 | 9439 | 6763 | 5469 | 6729 | 7486 | 10513 |
| Pig | 315 | 80440 | 64738 | 48146 | 60684 | 68207 | 98298 |
| Arable | 7 | 573 | 457 | 596 | 727 | 844 | 1316 |
| Arable | 55 | 12903 | 12318 | 12770 | 13406 | 14475 | 18749 |
| Arable | 735 | 145038 | 129858 | 122599 | 139938 | 157065 | 225573 |
| Mixed | 6 | 94 | –100 | –300 | –81 | 52 | 607 |
| Mixed | 18 | 2480 | 1647 | 1819 | 2527 | 2952 | 4670 |
| Mixed | 12 | 3787 | 2331 | 2959 | 3334 | 3560 | 4551 |
| Mixed | 33 | 7869 | 5958 | 6391 | 7807 | 8656 | 12099 |
| **WA*** | **10** | **1282** | **895** | **892** | **1252** | **1488** | **2461** |
| **Positive income farms*** | % of farms | **47.7** | **35.5** | **35.5** | **35.5** | **91.1** | **91.1** |
| | % of area | **81.9** | **74.4** | **74.4** | **74.4** | **94.5** | **94.5** |
| **Poor soils** | | | | | | | |
| Farm type | Farm size (ha) | Base 2001/02 | NAC 2004 | A0% | A25% | A40% | A100% |
| Dairy | 3 | –806 | –837 | –820 | –749 | –703 | –469 |
| Dairy | 18 | –1392 | –1607 | –1737 | –1372 | –1160 | –235 |
| Dairy | 55 | 5034 | 3945 | 6628 | 7851 | 8624 | 11715 |
| Dairy | 499 | 34679 | 21226 | 52395 | 72934 | 82402 | 121403 |
| Pig | 6 | –1172 | –1269 | –1413 | –1193 | –1061 | –531 |
| Pig | 16 | –1692 | –2569 | –2580 | –1964 | –1595 | –116 |
| Pig | 32 | 1836 | –1334 | –805 | 438 | 1183 | 4166 |
| Pig | 299 | 6706 | –15058 | –8191 | 3562 | 10614 | 38820 |
| Arable | 7 | –1242 | –1291 | –1358 | –1136 | –996 | –434 |
| Arable | 52 | –4091 | –4442 | –4613 | –2937 | –1760 | 2950 |
| Arable | 698 | –56730 | –60715 | –63198 | –40207 | –24447 | 40038 |
| Mixed | 6 | –1 | –397 | –377 | –213 | –115 | 347 |
| Mixed | 17 | 574 | –550 | –573 | –161 | 88 | 1079 |
| Mixed | 11 | 1767 | 160 | 321 | 622 | 803 | 1577 |
| Mixed | 31 | 3148 | 1168 | 1628 | 2462 | 2964 | 4966 |
| **WA*** | **9** | **–757** | **–1054** | **–1030** | **–769** | **–609** | **72** |
| **Positive income farms*** | % of farms | **5.4** | **2.4** | **2.4** | **3.4** | **5.4** | **20.9** |
| | % of area | **25.5** | **9.5** | **9.5** | **21.4** | **25.5** | **44.6** |

* Weighted avrage, weighted by a number of farms or area, for estimated number of farms in Poland, represented by analysed farm types.

The results of modelling further show that the financial situation of farms on good soil will be quite different from those on poor soil. The majority of farm types in the cluster of farms on good soil generate positive farm incomes, while the group of farms on poor soil contains only a few with a surplus.

For the farms on good soil the farm type-weighted share of farms generating positive farm incomes ("positive income farms ") in the "no change" variant is 35.5 % under Agenda 0 % as under Agenda 25 %, growing up to 91 % with an increase in the rate of payments. The corresponding figures for farms on poor soil are much lower, varying be-

1) Average weighted by estimated number of farms in Polish agriculture represented by each farm type.

tween 2.4 % (no accession, Agenda 0 %) and 3.4 % to 5.4 % for Agenda 25 % and Agenda 40 %, respectively, and reaching up to 20.9 % when the full rate of payments is paid.

Table 8: **Farm income** (€) **under different policy scenarios – "optimisation" variant – 2004**

| Farm type | Farm size (ha) | Base 2001/02 | NAC 2004 | A0% | A25% | A40% | A100% |
|---|---|---|---|---|---|---|---|
| **Good soils** | | | | | | | |
| Dairy | 3 | –29 | –94 | 220 | 580 | 801 | 1716 |
| Dairy | 19 | 3314 | 2477 | 3390 | 4419 | 5099 | 7873 |
| Dairy | 58 | 23683 | 21180 | 25961 | 28550 | 30656 | 39519 |
| Dairy | 525 | 167733 | 152637 | 168242 | 181799 | 196644 | 259598 |
| Pig | 6 | –297 | –466 | –522 | –470 | –392 | –75 |
| Pig | 17 | 2127 | 1027 | 1007 | 1240 | 1572 | 2902 |
| Pig | 34 | 10666 | 7955 | 6738 | 7190 | 7933 | 10903 |
| Pig | 315 | 92430 | 72474 | 60305 | 64395 | 71814 | 101488 |
| Arable | 7 | 762 | 622 | 689 | 795 | 906 | 1347 |
| Arable | 55 | 14831 | 14110 | 13717 | 14082 | 15089 | 19117 |
| Arable | 735 | 178889 | 162763 | 141265 | 151271 | 167482 | 232747 |
| Mixed | 6 | 437 | –483 | 442 | 794 | 1038 | 2012 |
| Mixed | 18 | 3299 | 2139 | 2872 | 3444 | 3990 | 6615 |
| Mixed | 12 | 4460 | 2612 | 4380 | 4894 | 5303 | 7088 |
| Mixed | 33 | 9681 | 7038 | 8761 | 9966 | 11007 | 15254 |
| **WA*** | **10** | **1676** | **1160** | **1455** | **1838** | **2158** | **3467** |
| **Positive Income** | %offarms | **47.7** | **35.5** | **91.1** | **91.1** | **91.1** | **91.1** |
| **Farms** | %ofarea | **81.9** | **74.4** | **94.5** | **94.5** | **94.5** | **94.5** |
| **Poor soils** | | | | | | | |
| Farm type | Farm size (ha) | Base 2001/02 | NAC 2004 | A0% | A25% | A40% | A100% |
| Dairy | 3 | –724 | –718 | –629 | –490 | –408 | 53 |
| Dairy | 18 | –1196 | –1390 | –996 | –368 | 21 | 2242 |
| Dairy | 55 | 6092 | 4979 | 9067 | 10489 | 11374 | 14981 |
| Dairy | 499 | 43791 | 26322 | 74739 | 89506 | 99369 | 150513 |
| Pig | 6 | –982 | –1110 | –1231 | –1019 | –884 | –457 |
| Pig | 16 | –1487 | –2348 | –2397 | –1796 | –1481 | 119 |
| Pig | 32 | 2514 | –1910 | –190 | 960 | 1644 | 4857 |
| Pig | 299 | 11349 | –25627 | –3933 | 6656 | 13504 | 43716 |
| Arable | 7 | –1188 | –1175 | –1308 | –1097 | –962 | –425 |
| Arable | 52 | –3961 | –4144 | –4510 | –2793 | –1606 | 3400 |
| Arable | 698 | –56680 | –57733 | –62644 | –37716 | –20091 | 48860 |
| Mixed | 6 | 124 | –160 | –171 | –28 | 67 | 602 |
| Mixed | 17 | 1072 | –1047 | 437 | 1099 | 1516 | 3930 |
| Mixed | 11 | 2333 | 209 | 1054 | 1455 | 1720 | 3351 |
| Mixed | 31 | 4367 | 1584 | 4214 | 5450 | 6230 | 10388 |
| **WA*** | **9** | **–601** | **–940** | **–739** | **–428** | **–234** | **726** |
| **Positive income farms*** | % of farms | **20.1** | **2.4** | **4.5** | **5.4** | **27.5** | **76.4** |
| | % of area | **35.5** | **9.5** | **13.5** | **25.5** | **50.9** | **82.3** |

*Weighted average, weighted by a number of farms or area, for estimated number of farms in Poland, represented by analysed farm types

It should be emphasized, however, that for Polish farms on the whole these ratios will be closer to those of farms on poor soil. This is because two factors, small farm sizes and poor soils both being adverse to generating favourable incomes but dominating within the existing structure of Polish agriculture, are underrepresented in the analysed sample of farm types.

Optimisation of farm production would increase the share of positive income farms. However, the initially low rate (25 %) of direct payments as proposed by the Commission leaves a large number of farmers dissatisfied with virtually no improvement or even worsening of their financial situation after the accession. Further, it should be mentioned that calculated farm incomes, supposed to include unpaid labour cost, are for a majority of farms not sufficient to cover the living costs at an acceptable minimum thereby strongly limiting any chances for farms to grow.

With regard to the sample of farm types analysed in this study, the weighted average farm income is positive under all policy scenarios for farms on good soil, whilst farms on poor soil generate a surplus only with the full rate of direct payments (Agenda 100 %), as shown on the diagram 5

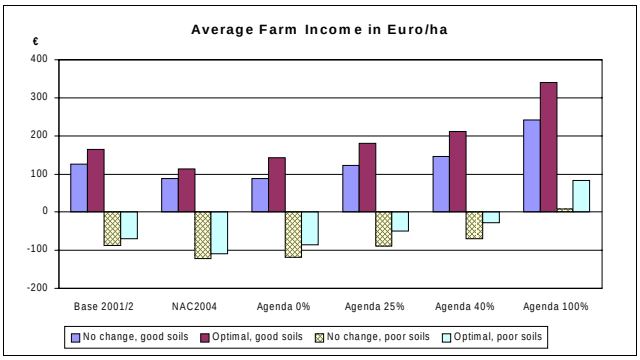


**Diagram 5**

The effects of the various Agenda scenarios, measured by the difference in the per-hectare farm income relative to the income generated under the base scenario, vary between farm types as shown on diagrams 6 and 7. Because the relation between farm types were the same regardless of the modelling variant, only the "no change" variant results are presented here.

There are two groups of farm types benefitting from the introduction of the Common Agricultural Policy, even with a low rate of direct payments granted to Polish farmers:

Dairy farms are able to increase farm incomes mainly due to the expected rise of milk and beef prices (with one exception under Agenda 0 %) but also because of direct payments, special beef and slaughter premia. Arable farms with a high share of crops eligible for area payments may increase their incomes under payment rates of 25 % or at least of 40 %, depending on farm type and soil quality.

With regard to pig and mixed farms, however, only payments exceeding 40 % would compensate for the expected fall in pig prices.

Taking into account the farm structure of Polish agriculture, with its majority of small-scale mixed farms and farms on poor soil, the overall assessment of CAP impacts on the financial situation of farms is less optimistic than that an evenly distributed sample of farm types would suggest. Farmers will profit from the introduction of the CAP compared to the base year or "no-accession" scenarios, but with only 25 % of the payments profits will certainly remain below expectations.

## 4 Conclusions

Structural change of agriculture and farm consolidation in Poland would "lead to beneficial results" as concluded by LERMAN (2002). Productivity increase and more market orientated farm strategies (MAJEWSKI, DALTON, 2000) also belong to the factors which are decisive for improving the financial situation of Polish farmers. While all such changes are prerequisite, adjustment cannot be made with short delay. Polish farmers presently face a difficult financial situation and therefore expect that CAP payments will increase farm incomes. Moreover, they are afraid that their own competitive position might be impaired by higher payments given to farmers in EU Member states. The importance of payments will be even greater, if weak prices

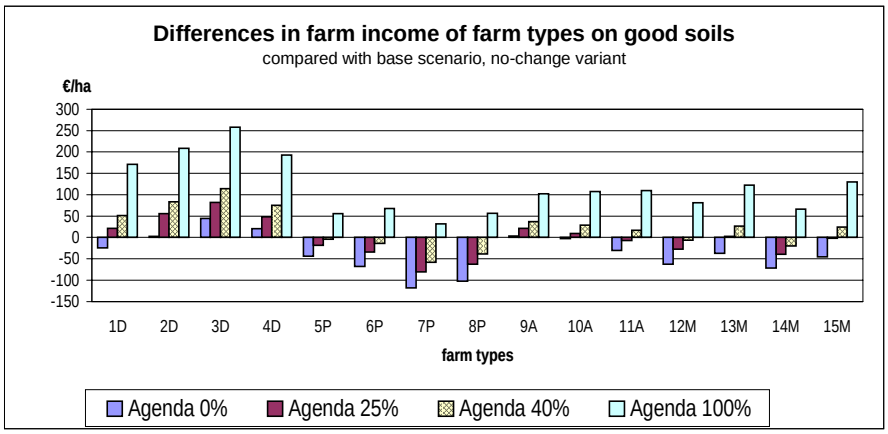


**Diagram 6**

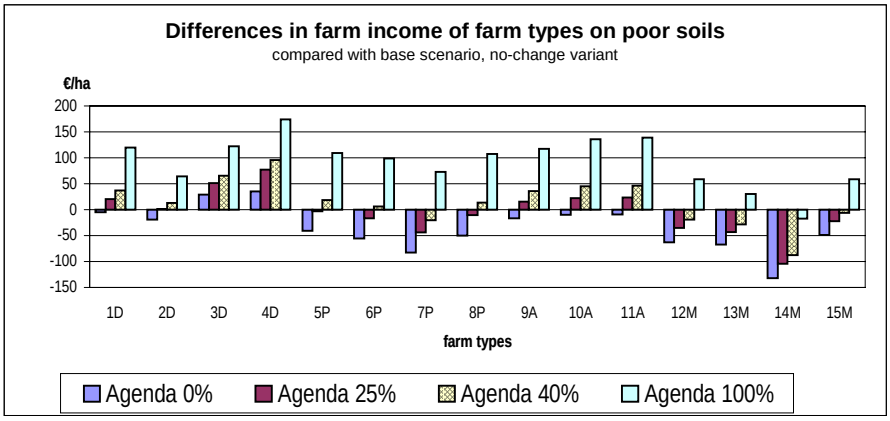


**Diagram 7**

on agricultural commodity markets and strong input prices continue. As revealed by this study, the level of farm incomes in Polish agriculture may be lower in 2004 than in 2001/2002. Thus, Polish farmers understandably wish to get CAP support after accession. The level at which those expectations will be met, will be seen after accession from the number of farmers satisfied or dissatisfied with the new agricultural policy.

The modelling results indicate, that without direct payments farm incomes of all farm types would be diminished in 2004, both under the accession and the non-accession scenarios. Direct payments at the 25 % rate as proposed by the European Commission are found on average to equalise the farm income with that from the base year. It should emphasised, however, that under those circumstances only a small percentage of farmers in Poland would be able to overcome the existing difficult financial situation. Falling incomes of pig and mixed farms, as well as of extensive farms on poor soil, that dominate Polish agriculture, will not sufficiently be compensated at this low rate of payments.

At least until 2004, the introduction of direct payments should not cause significant changes in the production structure. Immediate changes in the cropping patterns will rather be driven by the introduction of the set-aside scheme. However, model results give some evidence, that shifts in the cropping structure (increased share of crops elegible for payments) and reductions in livestock density may occur.

Regardless of the level of direct payments, longer-term adjustments are expected to be driven to a large extent by the market situation and macro-economic conditions. Higher rates of direct payments would on the one hand allow many farmers to improve their presently low living standards and create favourable impacts on investments required for restructuring Polish agriculture. On the other hand, however, increased incomes and improved living standards may also restrain people from leaving the sector and prevent the land from being used more efficiently.

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Authors:

EDWARD MAJEWSKI,
SLAWOMIR STRASZEWSKI,
ADAM WAS,
Warsaw Agricultural University, Farm Management Department, Warsaw (E-mail: Majewski@alpha.sggw.waw.pl)

LUDGER HINNERS-TOBRÄGEL, Institut für Agrarentwicklung in Mittel- und Osteuropa, Halle (Saale) (E-mail: Hinners@iamo.de)