THE IMPACT OF THE COMMON AGRICULTURAL POLICY ON THE INVESTMENT BEHAVIOUR OF POLISH FARM HOUSEHOLDS

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A b s t r a c t. This paper analyses farm-household strategies and investment behaviour of Polish farmers with a particular focus on the perceived effects of CAP. The paper is based on a survey of Polish farmers carried out in 2006 on a sample of 63 farms. Farmers where selected in order to fit in the intersection of different farms' location (altitudes above sea level), different specialisation level and technologies. Selected farm-households were modelled with the use of multicriteria dynamic programming. Models simulate economic behaviour of farmers under different policy (decoupling and reduction of payments options) and market (reduction of prices) scenarios. Results show multifaceted expectations toward sthe future. CAP payments are normally used on farm and concentrated on covering current costs and investment expenditure. The perspective of decoupling is expected to produce either no change or an increase of on farm investments.

INTRODUCTION AND OBJECTIVES

The EU Common Agricultural Policy (CAP) plays an important role in determining viability of farms and development trajectories in rural areas. In policy analysis exercises carried out up to now, the issue of policy impacts on investment behaviour seems to be insufficiently studied, particularly if confronted with the importance of the long-term investment decisions [Baum et al., 2004, European Commission 2003, OECD 2005]. At the same time, literature emphasises the complexity of this issue, in relation to structural adjustment, labour and capital markets, uncertainty and household life cycle [Happe 2004, Lagerkvist 2005, Latruffe 2004, Sckokai and Moro 2006].

This paper analyses the farm strategies and investment behaviour of Polish farmers facing present markets and policy challenges, with a particular focus on the effects of the CAP and considering different policy and markets scenarios.

The methodology adopted is based on the integration of empirical primary information collected through a survey of farm households with the modelling exercise of individual farms located in five different regions of Poland.

The paper is structured as follows. Section 2 describes the background situation of Polish agriculture. Section 3 describes the methodology adopted. Section 4 describes the case studies to which the methodology is applied. Section 5 discusses the results. Section 6 presents the policy implications and conclusions.

BACKGROUND: SCENARIOS AND CHALLENGES OF AGRICULTURE IN POLAND

Polish agriculture with its about 16 million hectares of agricultural land belongs to the largest agricultural sectors in the EU-27. Among many of the specific features of the agricultural sector in Poland the following few key characteristics should be mentioned: weakening role in the national economy, fragmented pattern of land ownership and farm structures. Although the share of private ownership was in Polish agriculture always very high (75%) compared with other former socialist countries, before 1989 still 25% of agricultural land was operated by state and co-operative farms. The transition to market economy initiated in 1989 resulted in almost complete privatization and transformation of the majority of former state farms into commercial companies. As a consequence, however, the distribution of land ownership is highly skewed. Generally, farms in the North and North-West of Poland are much larger than in the South. The total number of farms in Poland (about 1.8 million) indicates the magnitude of the structural problem that Polish agriculture is facing. Yet, it should be emphasized that about 60% of all Polish farm holdings are smaller than 5 hectares of agricultural land. They are mainly (semi)subsistence farms, often with no sales to the market. At the opposite extreme of the Polish farms' pyramid there are about 20% of farms (including commercial companies) operating more than 20 hectares each, and all together more than 60% of the total agricultural area.

Polish agriculture shows lower productivity of land and labour compared to the EU-15, resulting from relatively worse natural conditions (mainly soil quality), structural problems, and also from a technological gap.

Polish agriculture is extremely varied, including many different farm types which reflect a huge variety of natural conditions as well as of traditional and advanced forms of technology.

The EU accession in the year 2004 has significantly changed the economic conditions for farming, and has exposed Polish farmers to a free market environment. Although Polish agriculture has been included in the CAP since 2004, adjustment processes have been initiated since mid 1990s due to policy changes in the pre-accession period. The dynamic changes in Polish agriculture brought about many threats, but also created opportunities for farmers. There is a significant number of farms which implemented growth strategies, resulting in the on-going farm size increase and concentration of land in clusters of larger farms as well as concentration in the livestock sector, leading to a movement of animals from small scale activities to specialised large scale farming [Majewski, Sulewski 2007]. These changes require investments in all types of fixed assets, including replacements of machinery and transportation means that are run down in a high number of farms.

METHODOLOGY

The methodology is based on a two steps approach. In the first stage, a survey was carried out on a sample of farms, in order to collect information about their present behaviour and stated reaction to policy changes. The survey includes information about farm and household structure, expectations, reaction to planned and intended investment, as well as to potential reforms such as decoupling of EU payments. Among the information collected, two main results are presented here. First, the use that households make of the money obtained from the CAP payments, i.e. how revenues from CAP are spent. Secondly, what can be households` possible reaction to the decoupling of direct payments.

In the second stage, selected farm-households were modelled using multicriteria dynamic programming [Asseldonk et al. 1999, Wallace, Moss 2002, Gardebroeck, Oude-Lansik 2004]. The model is designed to simulate farm investment behaviour in the face of external scenarios. It receives as an input the exogenous values of scenario parameters and produces as an output the computation of sustainability indicators for each scenario considered. The impact of different scenarios is assessed through comparison with the baseline scenario.

The theoretical model for household-level decision making, based on the multi-criteria approach, follows the following maximization approach [Wallace, Moss 2002, Romero, Rehman 2003]:

$$\text{Max} \quad Z(x) = F[z_1(x), z_2(x), ..., z_q(x), ..., z_Q(x)] \tag{1}$$

s.t.

$$x \in X \tag{2}$$

$$x \geq 0 \tag{3}$$

with:

Z – objective function,

z_q – value of attribute/objective q,

X – feasible set,

x – vector of decision variables.

The objective function is a representation of household utility. The farm household is expected to maximize the function defined as a combination of multiple criteria, each defined as a function of decision variables. The maximization is subject to constraints on decision variables, represented by the feasible set and by non-negativity constraints. The core model is based on the multi-criteria household linear dynamic programming model.

Policy scenarios selected for modelling are as follows:

1) Baseline 1: Agenda 2000 + current prices
2.1) Decoupling 1: 2003 reform + current prices
2.2) Decoupling 2: 2003 reform + lower prices (WTO scenario)
3.1) Payment cut 1: 2003 reform (up to 2013) + no payment after 2013 + current prices
3.2) Payment cut 2: 2003 reform (up to 2013) + gradual reduction of payments after 2013 + current prices
3.3) Payment cut 3: 2003 reform (up to 2013) + gradual reduction of payments after 2013 + lower prices

Scenario 1 represents the baseline used as a reference to assess the impact of decoupling, price and payment reduction. Baseline policy reflects the existing Single Area Pay-

ment Scheme (SAPS), in place in Poland since 2004. SAPS provides increasing payments up to 2013, at a changing rate. Actually, an option with full partial decoupling is under discussion, potentially starting in 2009. However, in our baseline scenarios, increasing payments have been assumed up to 2013, then payments are assumed to stabilise at the 2013 rate. Decoupling hypothesis concerns the total decoupling of payments since 2007 and with the payments in place in that year. The proposed gradual reduction of payments after 2013 is calculated as a linear reduction that reaches zero in 2020. The hypothesis concerning the WTO scenario has been defined by assuming a fall by 20% of all agricultural product prices.

AREAS STUDIED AND THE SAMPLE

The survey was carried out in 2006 in 5 regions of Poland. In each region the case studies were selected according to the dominating agricultural system (i.e. the most typical farm types have been chosen). It can be stated that all the selected regions, although not fully homogenous in terms of natural conditions and structure of agricultural production, are recognised as tending to specialise; at least they have a wide recognition of dominating production orientation. The basic characteristics of the regions selected for the survey are presented in Table 1.

Table 1. Regions description

Region	Characteristics
Mazowieckie	Central part of Poland, diversified natural conditions and agricultural production. Southern part of the region is the largest concentration of apple farms.
Swietokrzyskie	Central-southern part of the country, hilly. Diversified production: crop and animal production have similar share in the total output. No clear specialisation in the animal sector, although milk and pork production are the most important.
Malopolskie	Southern part of the country, hilly and mountainous areas. Animal production dominates.
Kujawsko-pomorskie	Central-north part of the country. Specialisation in pig production, although cereals, sugar beets and potatoes, have an important role.
Pomorskie	Northern part of the country. Diversified production: crop and animal production have a similar share in the total output.

Source: own calculations.

Table 2. Description of the farm sample

	Min	Max	Mean	Std. Deviation	% of farms with positive value
Family farms (number)	-	-	63	-	-
Age of farm head (years)	21	62	46	9	100
Succesor (% of "yes")	-	-	67%	-	-
Household head labour on farm (h/year)	301	2200	2015	452	100
Household head labour off farm (h/year)	0	1000	31	176	3
Household labour on farm (h/year)	642	10000	4972	2164	100
Household labour off farm (h/year)	0	4400	346	961	14
Total external labour purchased (h/year)	0	17600	2113	3161	70
Land rented in (% of total farm area)	-	-	22%	-	-
Total land (ha)	3.6	204	34	40	100
Share of organic products (%)	0	100	18%	37%	24
Debt/asset ratio	0	50	6%	10%	56
Payment amount in 2005 (euro/farm)	0	25805	3371	4740	98
Payment amount in 2006 (euro/farm)	0	25805	3449	4856	97

Source: own calculations.

There were 63 farms in the sample from plain and mountainous areas, with a different specialisation (arable crops, livestock, trees) and production systems (conventional, organic). Sample descriptives are summarised in Table 2.

All sampled farms were family farms, often with a relatively young head. Two third declared to have a successor. Labour availability was rather varied, reflecting different household structures and farm specialisations. The same applies to available land that counted between 3.6 and 204 hectares, with an average share of rented-in land around 22%. Average payments were around 3400 euro/farm, though with a high variability.

RESULTS

Farmers showed a wide and varied range of expectations about prices of agricultural products, that can either increase, decrease or stay stable (slight majority) (Table 3).

Table 3. Expected changes of key context parameters

Detailed list	Expected direction of change [%]				Size of change	
	Decrease	Increase	Stable	No reply	Mean	Std. Deviation
Product prices	27.0	33.3	36.5	3.2	0.99	0.17
Agricultural labour cost	1.6	65.1	17.5	15.8	1.06	0.08
Cost of agricultural capital goods	7.9	76.2	6.4	9.5	1.12	0.19
Cost of other production means	4.8	84.1	4.8	6.3	1.10	0.12
Decoupled payments	44.4	6.4	33.3	15.9	0.91	0.27
Rural development payments	22.2	23.8	36.5	17.5	0.98	0.28
Payments for organic production	17.5	34.9	33	14.3	1.09	0.44
Coupled payments	22	22.2	25.4	30.2	1.16	0.73

Source: own calculations.

Expectations are more concentrated in case of production factors (between 65 and 84% believe their cost will increase). On the contrary, expectations regarding policy parameters (rural development, organic payments) are rather evenly spread between optional answers, with an exception of decoupled payments which, as the majority is convinced, will decrease.

The range of expected changes show in fact that basically there is no relevant expectation of change for product prices and rural development payments, while increase in production costs, decrease in decoupled payments, and increase in organic payments appear of some relevance (normally + or – 10%).

Table 4. Importance of different household objectives (number of answers per ranking position)

Detailed list	Rank					
	1	2	3	4	5	6
Income certainty	48	13	1	1		
Household worth	6	22	21	5	5	6
Household consumption	2	8	8	14	7	14
Household debt/asset ratio	2	6	4	15	8	10
Leisure time	4	10	14	8	6	6
Diversification in household activities		4	7	6	16	

Source: own calculations.

Table 5. Importance of different constraints to expanding farming activity (number of answers per ranking position)

Detailed list	Rank		
	1	2	3
Market share/contract of key products	26	9	6
Unavailability of land from neighbouring	21	13	3
Liquidity availability	7	11	4
Total household labour availability	4	4	5
Household labour availability in key periods	4	9	10
External labour availability in key periods	4	5	5
Short term credit availability	1	3	6
Long term credit availability	2	2	1
Others	1	2	2
Total external labour availability		2	2

Source: own calculations.

Reduction of income uncertainty is the main focus of household objectives and may be likely read both as the need to maintain or increase income as well as to stabilise it (Table 4).

The farming activity is mainly limited by two constraining factors: market share of key products and unavailability of land from neighbouring farms (Table 5).

This shows substantially a two sided difficulty for the farmers interviewed, i.e. on the one hand they are related to the markets for their products, on the other hand they are concerned about the possibility to find land resources allowing for their expansion strategy.

The role of the CAP payments in these farms is to a large extent determined by its absolute value, which is often rather limited, with the exception of plain crops and livestock (Table 6).

As a reference hint about the role that CAP plays in the farm-household economy, farmers were asked about their use of revenues from CAP payments. Stated use of CAP payments shows that only livestock farmers intend to spent a noticeable share of payments (Table 7) for on-farm investments. The choice to use Payments for on-farm investment is positively correlated with the absolute and relative amount of payments as well as with farm size (Table 8).

Table 6. Amount of CAP payments received (euro/farm)

Technology	Area	Crop	Livestock	Orchard/ vineyard/forest
CONVEN- TIONAL	Mountain	960	1895	421
	Plain	11145	5573	901
ORGANIC	Mountain	-	1231	-
	Plain	1131	4581	-

Source: own calculations.

However, the use of revenues does not give any direct information about changes that would be produced in case of decoupling. For this reason, householders were asked directly about their reaction to the hypothesis of decoupling. The stated reaction shows effects in three main directions. As expected, „no reaction" was the most frequent answer in orchard and vineyard farms. Livestock farms and conventional mountain crop farms stated mostly the hypothetical increase of on farm investments. Only farms in plain areas, using organic technologies stated mostly the change in crop mix (Table 9).

It should be noted, however, that decoupling is a pure hypothesis at present in Poland and often farmers showed to have not clear perception about what it could consists of.

Table 7. Stated use of payments

Technol-ogy	Area	Specia-lisation	Stated use of SFP					
			On farm current expen-diture	On farm invest-ment	Off farm productive current expenditure	Off farm productive inves-tment	Off farm non-productive intermediate consumption	Off farm non-productive durable goods
CON-VEN-TIONA-L	Mou-ntain	Crop	100	-	-	-	-	-
		Livestock	57	26	3	7	4	3
		Fruit tree	100	-	-	-	-	-
	Plain	Crop	90	6	-	-	1	3
		Livestock	51	32	-	1	13	3
		Fruit tree	94	6	-	-	-	-
ORGA-NIC	Mou-ntain	Crop	-	-	-	-	-	-
		Livestock	15	85	-	-	-	-
		Fruit tree	-	-	-	-	-	-
	Plain	Crop	100	-	-	-	-	-
		Livestock	70	30	-	-	-	-
		Fruit tree	-	-	-	-	-	-

Source: own calculations.

Table 8. Correlation between use of CAP payments and potential explanatory variables

Variable	On farm current expenditure	On farm investment	Off farm productive current expenditure	Off farm productive investment	Off farm non-productive intermediate consumption	Off farm non-productive durable goods
Payment amount in 2005		+			+	+
Total external labour purchased	+				-	
Household head labour on farm				-		
Payment/revenue		+			+	+
Land rented in % of total farm area		+				+
Total land		+			+	+

Source: own calculations.

The choice to increase investment on farm is again positively correlated with the amount of payments and farm size, but negatively correlated with the presence of a successor and total external labour purchase (Table 10). In fact, this is consistent with the perception that households that are more labour-self-sufficient and with a perspective for staying in agriculture pursue strategies that are less dependent from policy changes.

The scenarios results in terms of percent change in income compared to the baseline scenario (standard deviation in brackets) are reported in Table 11. Decoupling brings about a small income reduction in plain arable farms. Livestock farms show differentiated effect. Plain farms increase their income in the period 2006-2013, while decrease in the following period; mountain livestock show no reaction in the period 2006-2013 and an increase in the

Table 9. Reaction to decoupling

			Reaction to SFP					
			Increase investment [%]		Decrease investment		Changes in crop mix [%]	None [%]
Technology	Area	Specialisation	On farm	Off farm productive	On farm	Off farm productive		
CON-VEN-TIONAL	Mountain	Crop	100	-	-	-	-	-
		Livestock	43	7	-	-	14	36
		Orchard/ vineyard/forest	10	-	-	-	-	88
	Plain	Crop	40	20	-	-	-	40
		Livestock	88	-	-	-	-	12
		Orchard/ vineyard/forest	13	-	-	-	-	88
ORGA-NIC	Mountain	Crop	-	-	-	-	-	-
		Livestock	100	-	-	-	-	-
		Orchard/ vineyard/forest	-	-	-	-	-	-
	Plain	Crop	-	-	-	-	100	-
		Livestock	50	-	-	-	33	17
		Orchard/ vineyard/forest	-	-	-	-	-	-

Source: own calculations.

Table 10. Correlation between reaction to decoupling and potential explanatory variables*

	Increase investment			Changes in crop mix	Changes in other activities	None
Variable	On farm	Off farm productive	Off farm non-productive			
Payment amount in 2005						
Total external labour purchased	+					
Household head labour on farm	-			-		+
Household head labour off farm	-	-		+		+
Succesor	-			+		-
Number of part time workers	-					
Land rented in % of total farm area	+					
Household labour on farm	+					
Total land						

* No significant correlation was found with the statement that investments were reduced
Source: own calculations.

following period. A reduction in prices of 20% causes a strong reduction in income from farming, with abandonment of farming by some farms in the second period[1]. Scenarios 3.1, 3.2 and 3.3 show a strong effect after 2013, due to the importance of payments compared with other sources of income from farming. The standard deviation of results emphasises however the variability within each system, due to the very different reactions by single farms.

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1 The negative effect of decoupling was partly influenced by the choice of 2007 as the reference year, so that decoupled payments did not follow the increases expected for area based payments.

Table 11. Impact of the scenarios on Farm Income[%]

	Scenario 2.1		Scenario 2.2		Scenario 3.1		Scenario 3.2		Scenario 3.3	
	2006-13	2014-21	2006-13	2014-21	2006-13	2014-21	2006-13	2014-21	2006-13	2014-21
Plain Livestock [%]	3	-5	-36	5	9	75	3	52	-36	24
	16	7	7	119	10	245	15	163	28	175
Plain Arable {%]	-10	-11	-60	-66	-23	-43	-23	-37	-51	-53
	8	9	9	39	31	49	31	43	22	46
Mountain Livestock [%]	0	4	-50	-63	-4	-32	0	-28	-43	-63
	6	9	9	35	5	40	6	38	28	30

Source: own calculations.

Investment reaction tended to vary greatly, which is also a likely consequence of varied initial capital endowment (Table 12). The most consistent situations are connected to the extreme scenarios (simple decoupling and decoupling + payment reduction + price reduction). Decoupling in the short run consistently produces an increase of investment; payment and price reduction consistently brings a strong reduction of investments. Diffe-rences even among „comparable" scenarios are evident even in the first period (i.e. 2.1 and 3.1) and might be explained as an anticipation of policy changes in the second period. Compared with income change, the variability within each system is here even more impor-tant. This emphasises the very different incentives to investments connected with farm characteristics, rather than the system they belong to.

Table 12. Impact of the scenarios on investment [%]

	Scenario 2.1		Scenario 2.2		Scenario 3.1		Scenario 3.2		Scenario 3.3	
	2006-13	2014-21	2006-13	2014-21	2006-13	2014-21	2006-13	2014-21	2006-13	2014-21
Plain Livestock [%]	3	35	-39	-35	-25	-33	-6	-52	-30	-16
	31	98	98	45	66	48	17	86	96	44
Plain Arable {%]	18	-6	374	-52	246	-59	-10	096	501	-59
	51	11	11	48	664	90	103	158	1201	87
Mountain Livestock [%]	43	-4	-22	-43	-32	-20	41	-29	-53	-99
	102	27	27	40	80	23	104	69	113	183

Source: own calculations.

DISCUSSION

This paper focuses on getting an empirical evidence and insights about farmers' expec-tations, strategies and reactions to CAP changes in Poland. The sample, though biased towards most dynamic and collaborative farmers, showed a positive attitude towards pur-suing and expanding farming activities. Farmers also showed multifaceted expectations about the future, mostly revealing the feeling that (i) the gap between gross revenue and costs will continue to decrease (and consequently the profit margin will decrease) and (ii)

the role of the policy will be most likely reduced and more focused. A main outcome of the study is that in most cases CAP payments are used on-farm and concentrated on covering current costs and investment expenditures. However, reactions to decoupling are highly differentiated both across different systems and across farms in the same system. Accordingly, differences in reaction are better explained by different individual household/farm characteristics (structure, resource endowments and human capital), rather than by association with a specific agricultural system. Overall, in the more efficient and expansion-oriented farms, decoupling is perceived as an opportunity for investment, while in small, poorer performing farms the SFP introduction is viewed rather as an opportunity for extensification. Altogether, the hypothetical post-decoupling CAP looks very much, from the point of view of the Polish farmers interviewed, like a policy which may take different roles depending on the context in which it is cast. As a result, the study hints at the fact that a number of wider issues should be addressed more directly in order to understand farm household behaviour with respect to policies. In particular, demographic trends, labour and land use opportunities, technological options and personal strategies seem to be increasingly major drivers of farm reaction to CAP.

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WPŁYW WSPÓLNEJ POLITYKI ROLNEJ NA ZACHOWANIA INWESTYCYJNE ROLNICZYCH GOSPODARSTW DOMOWYCH W POLSCE

Streszczenie

Artykuł dotyczy strategii rolniczych gospodarstw domowych i zachowań inwestycyjnych polskich rolników, ze szczególnym uwzględnieniem przewidywanych skutków zmian wspólnej polityki rolnej (WPR). Badania przeprowadzono w 2006 roku na próbie 63 gospodarstw. Dobór gospodarstw przeprowadzono według kryteriów ukształtowania terenu (na terenach płaskich i górzystych), kierunku produkcji (roślinne, zwierzęce, sadownicze) i systemu gospodarowania (konwencjonalne i organiczne). Dla badanych gospodarstw sporządzono modelowe rozwiązania z wykorzystaniem wielokryterialnego programowania dynamicznego. Modele symulują inwestycyjne zachowania rolników w warunkach różnych scenariuszy polityki rolnej (de-coupling, redukcja płatności, redukcja cen). Wyniki wskazują na zróżnicowane zamierzenia inwestycyjne, wyjaśnione raczej przez indywidualne cechy rolnika i zasoby gospodarstwa, niż przez system gospodarowania i kierunek produkcji.

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