

# **Agro-Ecological Zones and their Impact on Farm Production and Farm Organization after Privatization in Azerbaijan.**

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## **Abstract**

The privatization of agriculture in Azerbaijan started in the mid 1990s, while the pace of privatization in the country differs. Some Rayons have privatized almost all of the former state-owned agricultural land while others hold a wait and see strategy. The agricultural administration observes the recent agricultural development with suspicion. Specifically, there are concerns about the decrease in wheat production in the area and about a possible collapse of agriculture production in general. In addition to the perceived changes in agriculture production there are obvious problems on the management of natural resources, which may have an impact on farm production.

In this paper we present the results of a combined natural resources and farm household survey conducted during the first six month of the year 2000 in Sagatalla Rayon.

The results show the Rayon can be divided into five agro-ecological zones. Agriculture is concentrated in two zones. Average farm income was higher among the households farming in the less favorable agricultural zone, while on a hectare basis the average gross margin for major crops was higher in the more favorable agro-ecological zone. Households without off-farm income opportunities were the losers of privatization.

The results further show that wheat production cannot compete with other annual crops like tobacco, maize and vegetables. Further results on net-benefits of improved natural resource management and implications for regional agriculture policies will be discussed.

*Keywords: agriculture production, agro-ecological zones, Azerbaijan, privatization*

## **Introduction**

The privatization of agriculture in Azerbaijan started in the mid 1990s, while the pace of privatization in the country differs. In some Rayons, families receiving land almost immediately took possession of it and established individual holdings, while in others they hold a wait and see strategy. The Rayon of Sagatalla in the Northwest of Azerbaijan is one of the front-runners in privatization. The land reform redistributed land by about 0.3 to 0.4 ha per family member. Agriculture currently is the most important sector of the Rayon. More than 70% of the active labour force is employed in the agricultural sector and the sector contributed more than 80% to the total annual production value of the Rayon in 1997 (Rabenau, 1999).

The success of the agriculture sector depends among others on the sustainable use of the natural resources. These resources are important under production systems with a high degree of subsistence production (Barbier, 2000); a condition that can be found in several post-communist countries - and most likely before - of Eastern Europe and Central Asia.

Under the former state-controlled agriculture production systems, Kolkhoz and Sovkhoz farms were told what to grow, largely ignoring natural resource conditions for agricultural production. After the privatisation of agriculture where farm families are responsible for the management of small units of land agriculture production will change as resource users will take natural resource conditions into consideration and, hence, result in a more efficient allocation of natural resources (Beckmann, 2000; Schmitt, 1993). This differentiation in agriculture production can have several important implications for the agricultural sector. Agricultural extension services will face different demands by farmers if different crops are planted in different agro-ecological zones. The different agro-ecological zones may also require different development strategies because of differences in demand (Fan et al., 2000).

In this paper we will present the results of a farm survey showing that the privatization of agriculture has not resulted in the collapse of agriculture production. We will further show that the comparative advantage of wheat production is low compared to other production opportunities of the farm-household, and hence, that the shift from former wheat to other crops increased farm-household income. We will also answer two important questions about the impact of agro-ecological zones on household income. The first one is whether or not the income from a specific crop per area unit differs. The difference per area unit not necessarily has to result in a different household income, as households will react to the different agro-ecological conditions and adjust their agricultural activities. But households will not only adjust their agricultural activities but also their non-agricultural ones according to their opportunity costs of labour. The second one, therefore, is, whether or not the household income, including off-farm income, between the two agro-ecological zones differs.

The survey results show that the agro-ecological zones have a significant impact on productivity, but that the household income between the different zones was almost the same. Case studies on irrigation and the management of communal pastures demonstrate problems of natural resource management. The contributions ends with drawing conclusions related to future agricultural policies in Azerbaijan and transition countries in general.

## **Background Information**

Azerbaijan separated from the former Sowjet Union in the early 1990s and declared independence on August 30, 1991. The early years of independence were marked by the armed conflict over Nagorny Karabakh, an area in Azerbaijan dominated by Armenians. At the end of the conflict in 1993 Azerbaijan has lost control over 20% of its former territory to Armenia. In 1993 left Azerbaijan the rouble zone and adopted the Manat (AZM) as National Currency. From early on the different governments of Azerbaijan privatised the centrally planed economy. In February 1993 the first law on privatisation was adopted and in July 1996 the Land Reform Law. In some Rayons privatisation of agricultural land started as early as 1992. The government uses the experiences made in those Rayons for privatisation policies in the other ones. One of these Rayons is Sagatalla in the northern part of the country. The German Association for Technical Co-operation (GTZ) supports the privatisation process in Sagatalla Rayon.

## Agro-ecological Zones of Sagatalla Rayon

The agro-ecological zones were identified according to geology, morphology, soil structure and climate of the Rayon. In principle five agro-ecological zones can be identified. They are listed in Table 1.

*Table 1. Agro-ecological zones of the Sagatalla Rayon.*

Zone	Area [ha]	Elevation [msl]
1. High mountain zone	51440	1.500-3.648
2. Medium elevation mountain zone	21400	700-1500
3. Lower mountain zone	7346	500-700
4. Alluvial-proluvial river sediments	32500	300-500
5. Alluvial river sediments	36800	150-300
Total area	149486	150-3648

The high mountain zones are partially pastureland and used as the summer grazing areas for sheep and cattle herds. The medium and lower mountain zones are mainly forested areas. The two alluvial zones are the areas where agriculture takes place and are about 46% of the total area. The conditions for agriculture production are more favourable in agro-ecological zone 4 compared to zone 5, because of better rainfall conditions, soils, and availability of irrigation water. The neighbouring Gach Rayon uses 1509 ha of the total land area. 68446 ha of land in neighbouring Rayons are under the administrative guidance of Sagatalla Rayon. Additionally, almost 20000 ha of traditional summer grazing areas are part of Dakistan, Russia.

## Impact of agro-ecological zones on household income

The results of a farm-household survey that was conducted during the first six month of the year 2000 will be used to answer the questions about the relationship between household income and agro-ecological zones. The objective of the survey was to calculate the household income of randomly selected households from 24 extension districts of the Sagatalla Rayon using the Participatory Farming Systems Analysis approach as explained in Njenga et al. (2000).

Table 2 shows the gross margins per ha of the major agricultural crops. The gross margins for all crops were lower in zone 5. All differences were statistically significant at the one percent level.

Table 3, Table 4 and Table 5 present the results at household level. They show the average household income over all households and separated by agro-ecological zone. On average, the farm income in zone 5 is about 10% above the farm income in zone 4 (see Table 3), while the off-farm income is about 45% higher in zone 4 compared to zone 5. The share of off-farm income on total household income is higher in zone 4 than in zone 5. The total household income is almost the same. This can be explained by the fact that households in zone 5 received more

land on average per household than households in zone 4. The bigger farm size, on the one hand, over compensated for the disadvantages because of the agro-ecological conditions. Households in zone 4, on the other hand, could compensate this with better off-farm income opportunities.

*Table 2. Comparison of average gross margins from different agro-ecological zones of major farm products (year 1999).*

product	no. farms	average gross margin per ha			
		total	zone 4	zone 5	comparison, %
hazelnuts	103	3.007.390	3.282.039	2.653.399	-19,2%
maize	73	1.160.403	1.406.580	969.067	-31,1%
tobacco	55	5.944.155	6.216.077	5.147.813	-17,2%
clover	54	953.962	1.017.302	816.103	-19,8%
hay	46	644.463	742.297	461.023	-37,9%
wheat	43	610.385	684.618	539.527	-21,2%

*Table 3. Distribution of average household income by income source and region, 1999*

	unit	all	zone 5	zone 4	comparison	
farm income	AZM	4112025	4386579	79%	3966673	-9,57%
off-farm income	AZM	1314686	1007741	21%	1477186	46,58%
household income (HHI)	AZM	5426711	5394319		5443860	0,92%
HHI per head*	AZM	1249930	1155957		1299735	12,44%
family members	no.	4,77	5,08		4,61	-9,17%
land area / household	ha	1,77	2,46		1,32	-46,34%
observations	no.	156	54		102	

\* weighted average

*Table 4. Distribution of average household income by income source and region, 1999. Households with agricultural income only.*

	unit	all	zone 5	zone 4	comparison	
farm income	AZM	3866692	4007303		3787012	-5,50%
off-farm income	AZM	0	0		0	0
household income (HHI)	AZM	3866692	4007303		3787012	-5,50%
HHI per head*	AZM	917092	819162		976549	19,21%
family members	No.	4,49	4,88		4,25	-12,95%
land area / household	Ha	1,61	2,29		1,22	-46,72%
observations	No.	47	17		30	

\* weighted average

A closer look on Table 4 and Table 5 shows that households without off-farm income in zone 4 have on average the lowest household income. The household income per head is lowest in households without off-farm income in zone 5.

The differences in household income between the two zones are not statistically significant, whereas the difference in average household income between households with and without off-farm income is statistically significant at the 10% level.

*Table 5. Distribution of average household income by income source and zone, 1999.  
Households with agricultural and off-farm income*

	unit	all	zone 5	zone 4	comparison
farm income	AZM	4217811	4560841	4041532	-11,39%
off-farm income	AZM	1881569	1470757	2092681	42,29%
household income (HHI)	AZM	6099380	6031597	6134213	1,70%
HHI per head*	AZM	1388612	1314999	1425418	8,40%
family members	No.	4,89	5,17	4,75	-8,06%
land area / household	ha	1,76	2,53	1,36	-46,25%
observations	No.	109	34	75	

\*weighted average

## **Two case studies on natural resource management**

The different agro-ecological zones provide different natural resources farm-households can use as an input for production. The management of natural resources, hence, will differ according to the agro-ecological zone. Two case studies, one on irrigation management and one on communal pasture management will illustrate management problems and highlight possibilities for future farm-household income improvements.

### **Irrigation management**

The Muchach River is a system of several streams providing five villages with water. Irrigation channels were constructed during the communist era. After the privatisation of land the Muchach Water User Association was founded to manage the irrigation system. There are several organizational problems that are related to the natural resource conditions that have to be solved to provide the households with sufficient water. The main riverbed changes continuously and the supply of water for the irrigation system is organized by using a caterpillar to direct the river. A continuous supply of irrigation water is difficult because of a dry spell during the summer and a high seepage rate in the irrigation system.

An improved irrigation regime will increase farm production. A comparison between irrigated and non-irrigated wheat in zone 4 indicates an increase in gross margin of about 61%. An investment in improved irrigation facilities over twenty years assuming additional increase in gross margins similar to the difference in for wheat could be justified if the total amount is below US\$ 3.3 Mio.

### **Management of communal pastures**

The privatisation of land in Azerbaijan includes the allocation of land to the municipalities. Every municipality has to provide communal pastures where farmers can send their cattle for free

grazing. As the municipalities are not allowed to sell or rent the land to individuals or group of individuals they do not directly gain from the provision of the land. Understandably, the municipalities selected land of the lowest agricultural quality and value as communal pastureland, mainly land flooded during the rainy season and/or prone to soil erosion. The prevention of further communal pasture land degradation under the current institutional setting allows only for management systems where users of the communal pastures agree to manage their common property. The economic returns from common management of communal pastures are very low. A study for the communal pastures of the city Aliabad indicate annual benefits of about AZM 60,000 per household, what is about 1% of average annual household income. This explains why there is no private incentive for common management of communal pastures. As long as the municipality has no legal possibility to receive income from the communal pastureland by selling or renting the land, there is no economic incentive for improving these natural resources.

## **Conclusions**

The study clearly indicates that the privatisation of agriculture did not result in a breakdown of the agriculture sector in Sagatalla Rayon. The results at crop level demonstrate that wheat production cannot compete with other crops like maize, fodder crops, hazelnuts, and tobacco. A shift from wheat to other products increased household income. The high gross margins do not confirm that farmers lacked "...the technical and managerial skills to maximize the earnings from the small plots of land.." as pointed out by FAO/WFP report (1999, p. 8). Also, deriving conclusions about the household income as done in the FAO/WFP report from the gross margins of wheat is misleading.

The different agro-ecological zones did not result in a statistically significant difference in farm income. The differences in farm size between the agro-ecological zones were statistically significant. The privatisation of land, therefore, did not discriminate against households that received land in the less favourable agricultural zone as they got a higher share of land. Also, the privatisation did not discriminate against the households that received less land in the more favourable agro-ecological zone as the differences in household income were not statistically significant.

Off-farm income is an important source of household income in Sagatalla Rayon. Looking only into income from agriculture to derive information about the economic situation of the rural population is extremely misleading.

Households without off-farm income opportunities are the losers of privatisation. If off-farm income would be considered during the privatisation of land, the economic situation of households would be more equal and the privatisation of land probably more socially acceptable.

The future improvement of farm-household income in Sagatalla Rayon depends to a large extent on improvements in irrigation. The incentives for improved irrigation schemes are high. The success of an improved irrigation scheme will depend more on solving the institutional problem than the technical one, but they cannot be solved independently. The incentives for improved communal pasture management are low. This can be solved by changing the legal framework about the property rights on communal pasture land.

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