CHAPTER 16.

THE ECONOMIC IMPORTANCE OF AGRICULTURE IN WESTERN BALKAN COUNTRIES[1]

Duško BODROŽA[2]
Marko DANON[3]

Abstract:

In this chapter, we analyse macroeconomic importance of agricultural sector in countries of the West Balkans (WB), as well as ways this sector is contributing (or hindering?) the economic growth. We are observing the most important macroeconomic challenges and a macro-picture of the agricultural sector (in the first chapter), and perspectives of this sector in the near future. By this approach, we are pointing to: (i) contribution of the sector to GDP, (ii) weak points of the regional agriculture, (iii) possibilities for advancement and (iv) contribution to the future growth. Hence, productivity becomes the corner stone of our analysis, affecting mostly: (i) unemployment reduction and (ii) current account deficit reduction, but also (iii) inflationary pressures. The next phase of development of the sector leads to its corporatization, thus creating presumptions for its accrued productivity.

Key words: *agriculture, west Balkans, productivity, European integrations*

INTRODUCTION

The agricultural sector in Western Balkans (WB) countries[4] has a relatively larger importance over its European counterparts. It may even be stated that WB

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[2] Duško Bodroža, MA, Research associate at the Institute of Economic Sciences, Belgrade, Serbia

[3] Marko Danon, PhD candidate at Université de Nice Sophia Antipolis, Nice, France

[4] WB countries comprise of : Albania, Bosnia and Herzegovina, Croatia, Macedonia FYR, Montenegro and Serbia.

economies are largely oriented on agricultural production, both in terms of foreign commerce and in terms of employment. In this chapter, we analyse and try to quantify the relative importance of agriculture in WB economies, in comparison with EU countries (the EU being the convergence target of the WB countries). This chapter is organized as follows.

We divide the chapter in two chapters, with the first one having two further sub divisions. The first chapter provides information on the macroeconomic stability of the WB, with a review of the 2000-2010 period. In the first chapter we also review the economic performance of the agricultural sector in WB, in comparison to its EU27 benchmark. In the second part of the same chapter, we are presenting the concrete results of WB agriculture. It is where we are presenting the results of crop production and animal husbandry. Going forth, in the second chapter, we will give ideas on future dynamics of the WB agriculture. After having identified major macroeconomic challenges and agricultural impediments in the first chapter, we want to see in the second chapter how agriculture may contribute to further growth and development of these countries. Lastly, we summarize the most important lessons learned from the chapter.

As for methodology, we observe the period spanning from 2000 to 2010, as the beginning of the observed period is also the beginning of the most intense phase of WB countries transition. Also, 2010 is selected to be the last year in the observed period given the scarcity of information. Going forth, the data is mostly obtained through Eurostat and to some smaller extent through World Bank Data Bank and from a number of scientific papers.

WHERE IS WB AGRICULTURE NOW? SITUATION OF THE AGRICULTURAL SECTOR IN THE WB COUNTRIES

Macroeconomic environment and major challenges

In order to understand the role of agriculture in the WB region, we opted to place the discussion within the macroeconomic field. In order to achieve this goal, we will present the macro data on the region, with the overview of the region's most important challenges, and to see how and in what way the agriculture is a part of the solution (or problem?). Before entering any other discussion, a short overview of location and basic demographic information is needed.

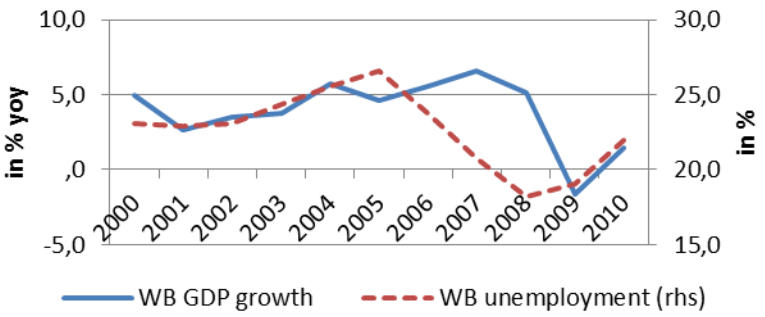
Table 1: Population and area statistics for 2011.

	AL	BA	HR	MK	ME	RS	EU27
Total area (000 km^2)	28.7	51.2	56.6	25.7	13.8	77.5	4,325.2
Population (million)	3.2	3.8	4.4	2	0.6	7.1	497.6
Population density (inhabitants/km^2)	111	75	78	80	45	95	115
Total area (where EU27 equals 100)	0.7	1.2	1.3	0.6	0.3	1.8	100
Population (where EU27 equals 100)	0.6	0.8	0.9	0.4	0.1	1.5	100

Source: WB's statistical offices, Eurostat

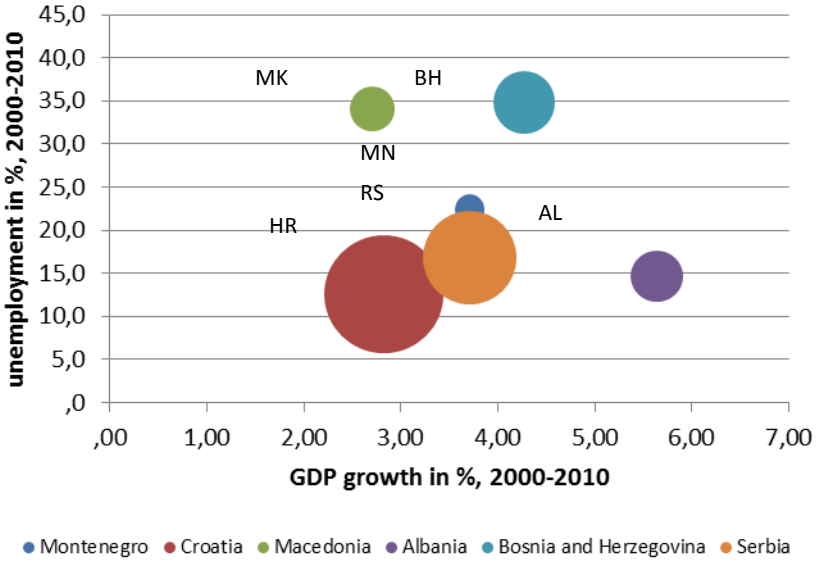
Apart from being small in size, the relative low significance of the region is also reflected in its European integrations lagging behind its East European peers. The region commenced its reforms only in 2000 (lagging behind most East European countries, which had already reached a mature phase in transition). The lagging was mainly driven by political instability, spanning from low level political tensions to all-out war in some of the region's countries. Hence, only when the authoritarian regimes of the 1990's were ousted, a place for European integrations opened. Albeit all WB's were granted the potential candidate status, Croatia and Macedonia have been fastest in obtaining the full candidacy (2004), faster than Serbia and Montenegro (2012 and 2011 respectively), whereas Bosnia and Herzegovina and Albania haven't still reached that phase. As seen before, the economic corollary of the European integrations were the profound economic reforms, characterized by, between other effects, trade liberalization and institutional (''rule of the game'') changes. The changes did trigger growth, particularly intense before 2008 crisis breakout, as is visible from Figure 1.

Figure 1: GDP growth and unemployment in WB countries in 2000 – 2010



Source: Eurostat

Figure 2: Unemployment, GDP growth averages over 2000-2010 period, relative to size of economy[5] in 2010

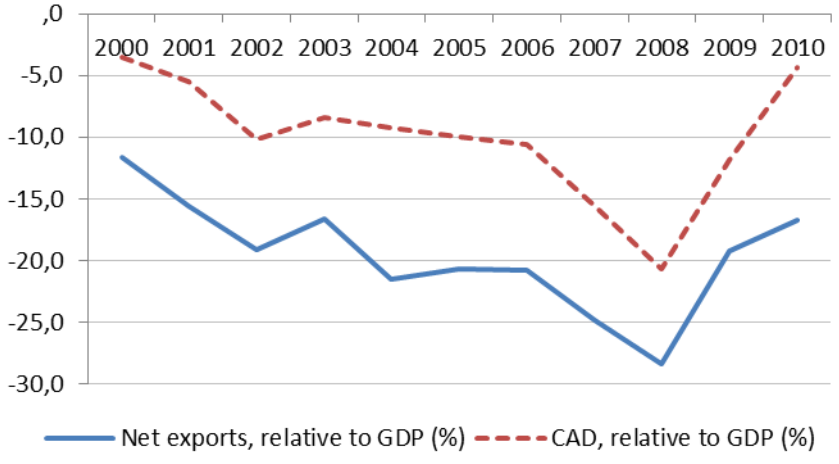


Source: Eurostat

The 2008 – onwards growth slowdown is a result of the global economic crisis that stroke a mighty blow on WB economies, and not of some endogenous, WB-specific, shifts. As the Figure 2 shows, Albania had the most robust growth (5.6% GDP growth average in 10 year observed period) - albeit on the lowest basis, while Macedonia grew slowest (2.7%). However, even with a relatively robust multi-year growth, unemployment remains persistently high. It reached a decade low in 2008, only to rebound in 2009, on effects of the economic crisis. Unemployment is highest in Macedonia (32% in 2010), and lowest in Croatia (11.8% in 2010). Apart from unemployment, the region faces a constant current account deficit (CAD) burden. A high CAD is provoked by high trade deficit, and is only to some extent offset by traditionally important remittances inflows. A high CAD in the WB's is a particularly important question, because of low financial capital inflows (external indebting, portfolio inflows and FDI), mostly due to the effects of the Eurozone crisis related risk aversion. Hence, a persistent CAD, in sync with faltering portfolio and FDI inflows (due to risk aversion surge), are putting downward pressures on domestic currencies, thus jeopardizing macroeconomic stability.

[5] Size of bubbles relates to size of an economy

Figure 3: CAD and trade deficit relative to GDP of WB countries



Source: Eurostat

Moreover, it becomes obvious that the CAD 2000 – 2008 deepening went in sync with the most intense GDP growth, pointing to a consumption driven growth, which is not in the same time the most efficient in absorbing a growing population of idle workers in the economy. Hence, the consumption driven, CAD - ridden growth, couldn't resolve the long-standing unemployment challenge, which even aggravated from 2008 onwards.

In most of the period, we may say that growth was driven by services sector, and in much lesser extent, by tradable sector (which we consider to be a sum of industrial and agricultural sectors, for the sake of the methodology), as shown on the following figure.

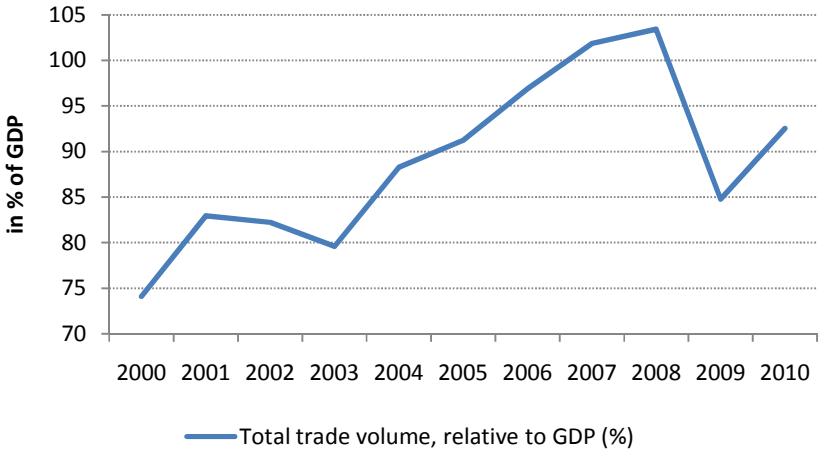
Figure 4: GVA contribution by branches in WB's

Source: Eurostat

The share of agriculture in total GVA is on the declining trend throughout the whole observed period, whereas services sector is gaining in importance. In all WB countries (except for Albania), the economic structure has been characterized by shrinking of the tradable sector (industrial + agri sector), and ballooning of the services. This trend was particularly intense in Montenegro and Macedonia, whereas Albania had an inverse trend consisting of re-industrialization[6]. Going forth, agriculture sector is the most important in Albania (19% of GVA in 2009[7]), although Albania recorded the fastest trend of decline of agri contribution to GVA. Agriculture had the least contribution in Croatia (5.5% in 2010), possibly on (i) relatively affluent economy and (ii) traditional importance of services – tourism – in that country.

Foreign trade – wise, as suggested beforehand, the European integrations opening did trigger an important rise of trade, as visible from the following figure. It should be noted, though, that the 2009 contraction is also due to the crisis, i.e. smaller exports due to faltering external demand going in sync with slowing domestic activity – related import contraction. However, in the aftermath of the crisis, the foreign trade started to recuperate.

Figure 5: Total trade volume of the WB's, relative to GDP (%)



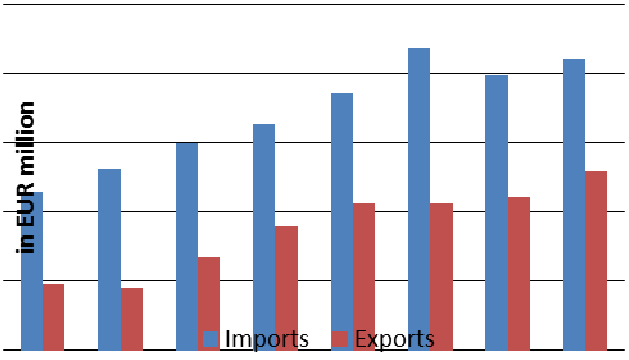
Source: Eurostat

[6] A precision is needed: only 10% of Albanian GVA is accumulated by the industrial sector, vs. 18% WB average. Hence, Albanian re-industrialization is merely an adjustment with the regional economic structure, and not a sign of a profound difference vis a vis other countries.

[7] 2009 is the last available information source for Albania

Within the international trade, agriculture in WB countries is not of primordial importance (with an exception of Serbia). So far, all the countries (except for Serbia again), are net importers of agricultural products. Both exports and imports display a clear trend of rise, but, exports stay resilient to the crisis effects, unlike the imports, which contract in 2009.

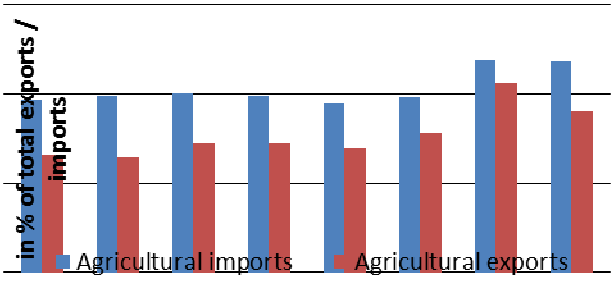
Figure 6: Total exports and imports of agricultural products in WB's



Source: Eurostat, authors' calculations

The rising trend of exports may be linked to rising productivity gains (what will be discussed afterwards), whereas the imports drop only in post 2008 years, given the shrinking economic activity in the region. Moreover, agriculture in most countries (except for Serbia) is not contributing to alleviating the CAD challenge, but rather contributing to it. Meanwhile, seeing the trade from a different angle, agricultural trade within the trade picture remains of little importance (again, Serbian exception being made).

Figure 7: Share of agricultural exports and imports in total trade, in % of total exports/imports

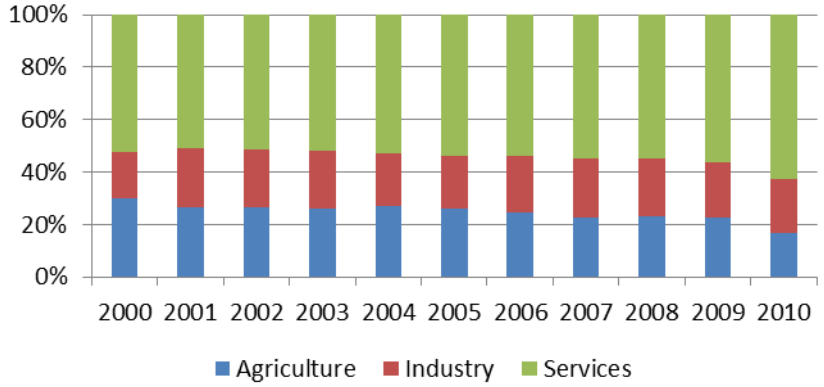


Source: Eurostat, authors' calculations

Except for Serbia, where some app. 19% of total exports are generated by agriculture (as in 2010), for most of WB countries, agriculture trade remains a low – interest territory, in the light of share in total trade volume. Country specific differences may be observed at this level too. In 2010, Montenegro had a share of 20% of agricultural imports within the total imports, whereas Serbia was at 6% only. Export – wise, it is Albania that is exporting the least in comparison with its total exports, 4% in 2010, whereas, again, Serbia, had the agri exports share at 20%.

Going forth, it seems that employment structure in the region has been changing as well, as shown at the following figure.

Figure 8: Employment structure in WB's as percentage of total employment

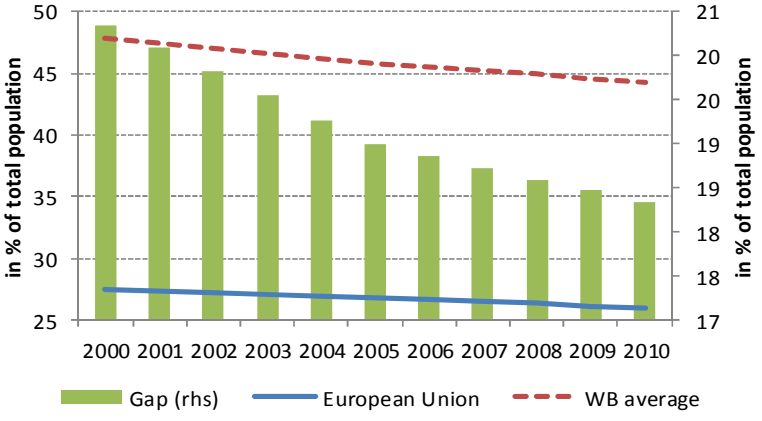


Source: Eurostat

Services sector, again, is showing a rising trend of contribution in employment structure, whereas agriculture is rapidly declining. Albania has the highest percentage of agricultural jobs – 55% on the average between 2000 and 2010, whereas Montenegro has it lowest – 6% over the 10 year period. On the other hand, it is again Albania that records the steepest drop in agri jobs. However, this picture is extremely blurred by regional differences. On the average, the agri jobs are on the decline. But, country specific differences here play an important role. For instance, Albania, Macedonia and Serbia record a drop in agricultural employment, whereas Croatia, Bosnia and Montenegro even had a rise (albeit very modest) both in agricultural jobs and in percentage of agricultural employment in total employment.

Due to massive political and economic changes in the region, there has been a relatively sizeable population shift from rural to urban areas, as presented by the following chart.

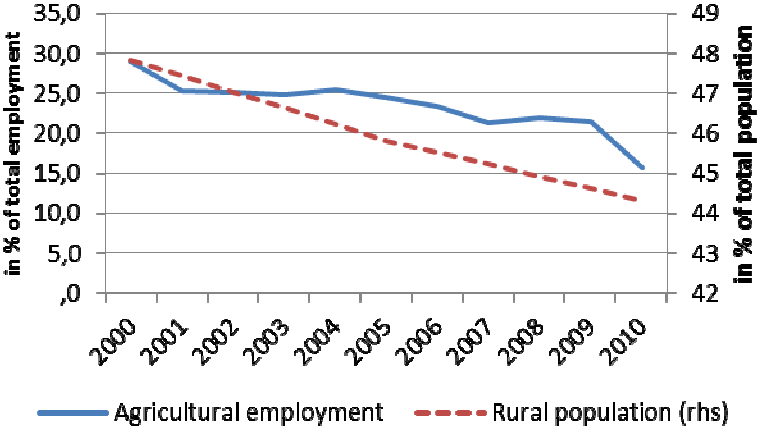
Figure 9: Rural population in EU and WB's



Source: Eurostat

Albeit still far from the EU average, the gap between EU27 and WB in share of rural population is narrowing. This might be an effect of growth of productivity of agriculture[8] and new possibilities being opened in urban centres. Indeed, the trends of agricultural employment and rural population are closely interrelated, as presented on the following figure.

Figure 10: Agricultural employment and rural population in WB's

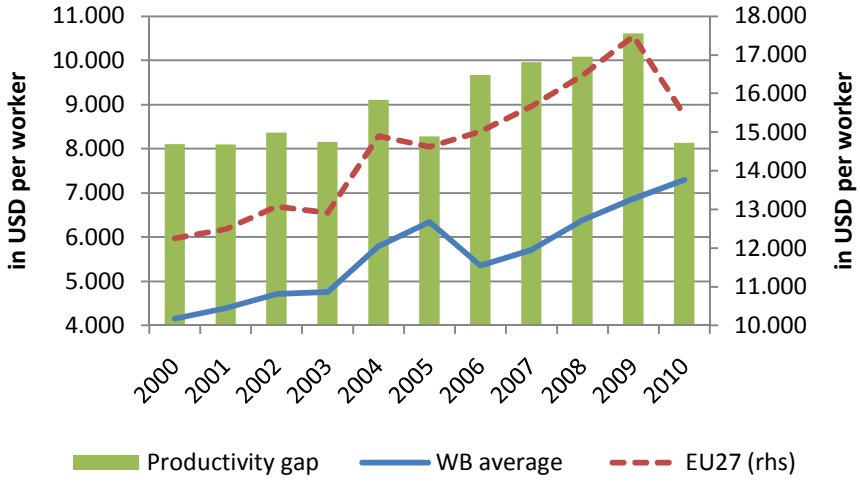


Source: Eurostat

[8] Because growth of productivity is narrowly linked to average size of farms and mechanization level. The two factors imply smaller number of agricultural jobs going in sync with a growing agricultural productivity.

Now, when we have the information on employment and per – sector GVA creation, we may also have some more in-depth ideas on productivity dynamics of the agricultural sector in the WB. Indeed, as seen at the following figure, WB agricultural productivity is growing, and it is following the EU27 trend. However, the spread between WB and EU27 productivity average is resistant to rising productivity gains in WB agricultural sectors, hence there is little convergence in the observed period, if not even some divergence[9]. Country – wise, Croatia and Bosnia and Herzegovina boast agricultural productivity at the EU27 level, whereas all the other WB countries are far below.

Figure 11: Agricultural productivity in EU27 and WB's, in USD per worker

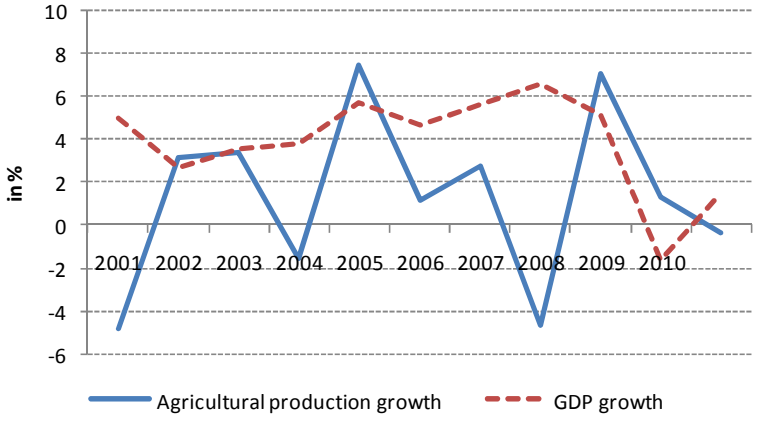


Source: World Bank Databank

However, the productivity rise, resulting from better machinery and chemicals used, couldn't offset slow – adjusting agricultural output growth. As we see on the following figure, agriculture production in all WB countries still seems to be of little cyclical correlation to overall economic trends, suggesting either that (i) WB agriculture is modestly integrated into the economy (i.e. has a small contribution to GDP), and/or (ii) its productivity is still heavily reliant on random weather conditions.

[9] It should be noted that the 2010 productivity gap dwindling is only due to massive improvement in Croatia's productivity, thus contributing to the overall WB average productivity.

Figure 12: Link between agriculture output growth and GDP growth y-o-y in WB



Source: Eurostat

Nevertheless, the basic production factor – land – in most of the countries, especially Serbia, continental parts of Croatia and north – eastern parts of Bosnia is very favourable for growing crops, whereas the hilly WB regions (most of Montenegro, Albania, Bosnia, Macedonia, southern Serbia, maritime Croatia) are very suitable for animal elevation. In comparison with the EU27, WB countries in average enjoy approximately the same share of agricultural land in total land area (app. 45%), whereas Serbia has an even higher share (app. 60%). However, the low productivity reflects again in a relatively lower irrigation, fertilizer and machinery usage than in some European countries[10].

*Table 2: Agricultural production factors indicators**

	Arable land (% of total land)	**Irrigated land (% of arable land)**	**Fertilizers used (kg per ha of arable land)**	**Machinery (units per 100 m^2 of arable land)**
Albania	43,94	16,78	45,54[2009]	122[2008]
B&H	41,73	N/A	24,52[2009]	N/A
Croatia	23,23	0,38	246,84[2009]	49[2002]
Macedonia	40,17	7,34[2007]	56,93[2009]	1.243[2007]

[10] Due to (i) scarcity of this information and (ii) slow rate of change of these indicators, we present a static – 2010 picture. Moreover, due to the information scarcity, we use at this case not the WB averages, but the accurate country-by-country statistics. Finally, Netherlands, France and Portugal are used as benchmarks, and not average representatives of the EU27.

	Arable land (% of total land)	Irrigated land (% of arable land)	Fertilizers used (kg per ha of arable land)	Machinery (units per 100 m^2 of arable land)
Montenegro	38,22	N/A	N/A	N/A
Serbia	57,80	0,61	133,78[2009]	17,70[2008]
Netherlands	56,83	10,55[2007]	240,9[2009]	1.301,53[2005]
France	53,44	5,06[2007]	148,27[2009]	635,32[2005]
Portugal	40,3	11,44[2007]	159,11[2009]	1.397,73[2005]

Source: Eurostat, World Bank Databank
** Data is from 2010, if not otherwise stated*

Going forth, another source of low productivity, apart from technology, lies within the farm structure. Seemingly small farms (some 3 – 10 times smaller than the EU27 average) impede higher productivity. As Connell and al. (2002) and Yee and al. (2004) point, the economic rationale behind is that the small(er) farms may not unlock the economy of scale effect, and thus they stay behind the productivity curve in comparison with the large ones. Putting it more simply – small farm production raises the unitary costs of production due to high labour intensity (unlike the capital – intensive, economy – of – scale large farm production).

Table 3: Farm statistics in WB and EU27

	Albania	Bosnia	Croatia	Macedonia	Montenegro	Serbia	EU27
Number of farms (in 000)	357	515	450	193	43	779	13,633
Average size of farm (ha/farm)	1,2	3,3	2,4	1,7	3,2	3,7	12,7
Share of farms up to 2ha	89%	50%	67%	90%	66%	46%	47%
Share of farms over 10ha		4%	5%	1%	5%	6%	20%
Share of agricultural area on farms over 10ha			52%	13%	41%	25%	85%
Average size of farms over 10ha (ha/farm)			25,7	20,0	24,2	16,5	54,9

Source: Tina et al (2010)

Agricultural production in WB countries

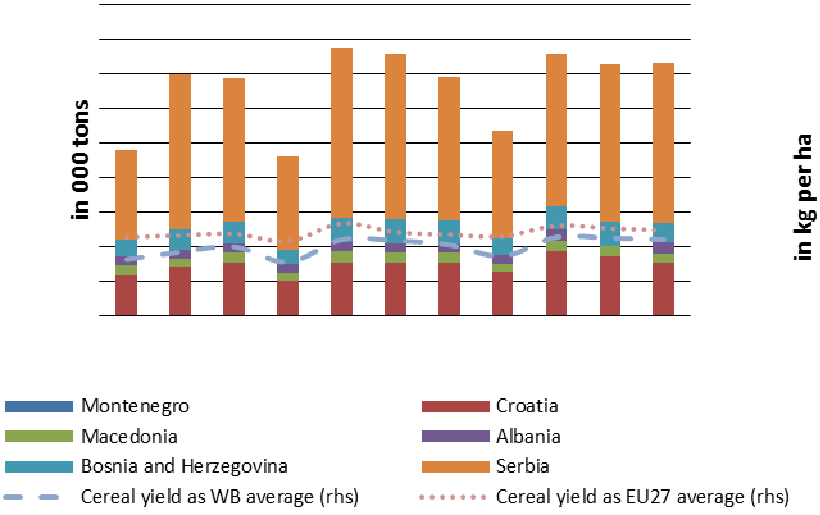
In the previous part, we have seen how the agriculture fits into the macro picture of the WB. We have also shed some light on macro characteristics of the agricultural sector: what is its macroeconomic importance, what is its productivity level, what are the trends, and where it is in comparison with a EU27 benchmark. However, an agricultural picture is inconceivable without a detailed summary of what are the predominant agricultural products created in the WB region. Hence,

we will give a detailed overview of the two basic agricultural branches – crop production and animal husbandry in the WB. By observing the 2000 – 2010 period, we will try to (i) draw basic conclusions on agricultural trends within the branch and (ii) to observe the convergence rate towards the EU27 productivity within the sector. Thus, we will be able to discern specific niches of WB agriculture, i.e. pinpoint areas where WB countries might concentrate in order to increase their agriculture's productivity.

Crop production

The most important crop categories in the WB are cereals (comprising of maize and wheat), followed by oil seeds and sugar beets. At following figures, we are presenting production in WB countries (where sugar beets and oil seeds production comprise only of Serbia/Croatia facts, other countries' production being insignificant)[11].

Figure 13: Cereals production and cereal yields in WB countries



Source: Eurostat

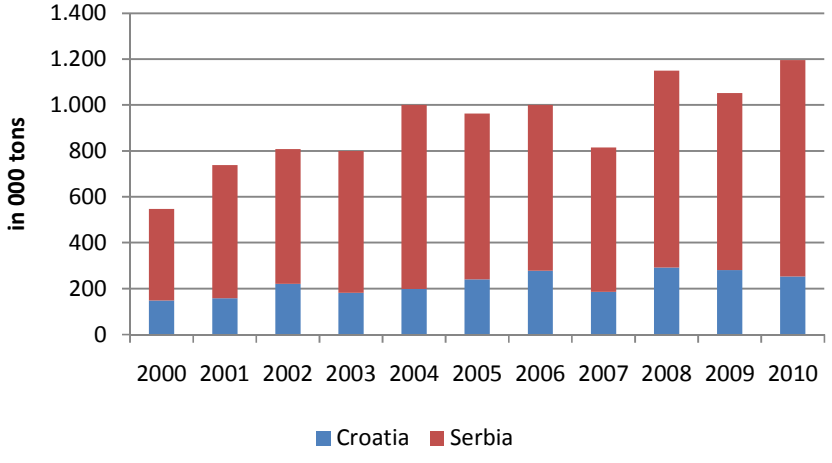
Cereals have a traditional importance in some WB countries, like Serbia and, to lesser extent, in Croatia. Due to very large plain high soil – quality terrains (Vojvodina in Serbia and Slavonia in Croatia), cereal production is being

[11] NB: Data for cereals are the only to include average yields of EU27 and WB, due to (i) data scarcity and (ii) much higher importance of cereals in the analysis comparing to the other crops

traditionally important. However, when we compare the cereal production to the EU27 benchmark, we see at least two essentials: (i) cereal productivity (measured as yield in kg per ha) is persistently lower in WB than in EU27, and consequently, (ii) cereal production is seemingly more dependant to the weather conditions[12] in the WB than in the EU27 (as lower productivity suggests a lower technological level, thus heavy reliance on the weather). Nevertheless, maize & wheat are increasingly important for some WB economies (notably Serbia), given its trade importance. However, as we see, after having increased productivity in the first three years in the observed period, the WB region has never breached 2004 production, which might suggest that no or little technological advance has been made.

On the other hand, oil seeds and sugar beets production displays a different growth pattern, as seen on the two following figures. Due to presence of large agricultural companies, that contribute to technological growth (on larger agricultural areas and modern machinery used), oil seeds and sugar beets represent a true success story in the WB, much unlike the cereals.

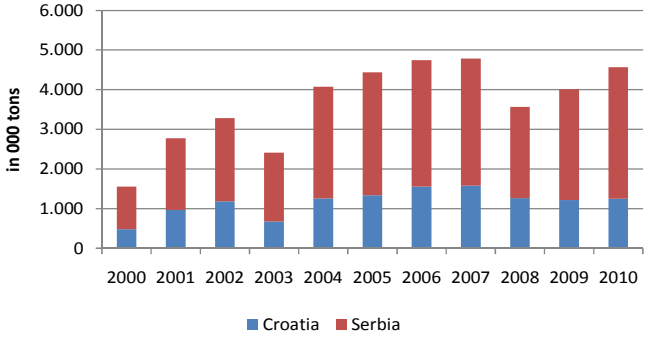
Figure 14: Oil seeds production in WB countries



Source: Eurostat

[12] In two ‘’bad’’ years, 2003 and 2007, WB’s cereal yield contracted by 22.3% yoy and 15.9% yoy respectively (vs. EU27’s -9% yoy and -2.2% yoy respectively)

Figure 15: Sugar beets production in WB countries

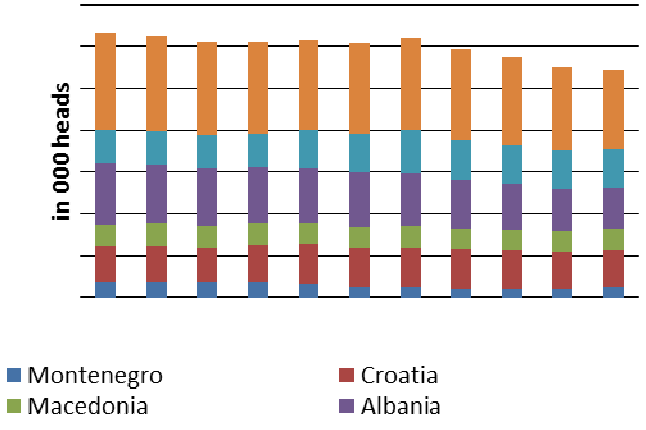


Source: Eurostat

Animal husbandry

The animal stock we are presenting in this chapter comprise of cattle, dairy cows (along with milk production), pigs, and sheep and goats. Generally, unlike crop growing, animal husbandry is the less successful agricultural branch in the WB. As pointed out by Upton (2004), livestocks are capital assets, produced in the past and contributing to future product output. Hence, that production tends to be more risky in an environment of low subsidies or absence of developed banking products for agriculture, impeding hedging in agriculture.

Figure 16: Cattle stock in WB countries

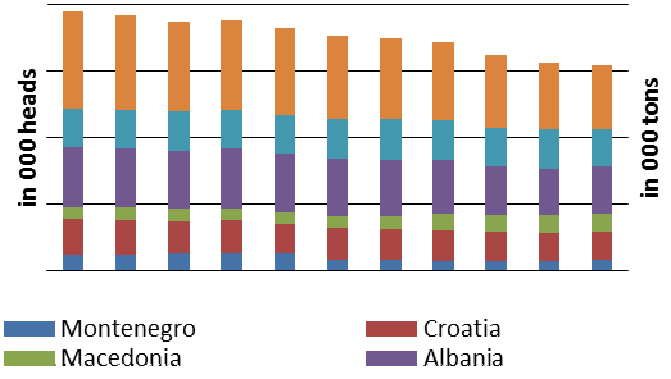


Source: Eurostat

The cattle stock has a clear trend of diminishing, especially marked after 2006. The regions' countries are equally and consequently experiencing a loss in dairy

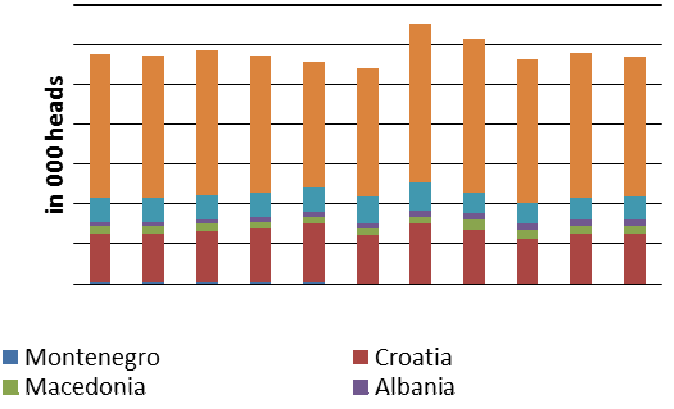
cows stock. However, the milk production has a reversed trend until 2007, i.e. the production is clearly growing until 2007, only to start diminishing afterwards. The initial milk production growth trend, contrary to the dairy cows' stock decrease is definitely a result of technological improvements in the first half of the 2000's. Afterwards, a drop in milk production is recorded, probably on the sharp decrease of the cows stock that speeded up in that period, a decrease that couldn't have been offset by technological improvements. In the cattle production in WB, Serbia is the largest producer, followed by Albania and Bosnia and Herzegovina, whereas Montenegro and Macedonia are at the bottom of the scale due to their limited territory.

Figure 17: Dairy cows stock and milk production in WB countries



Source: Eurostat

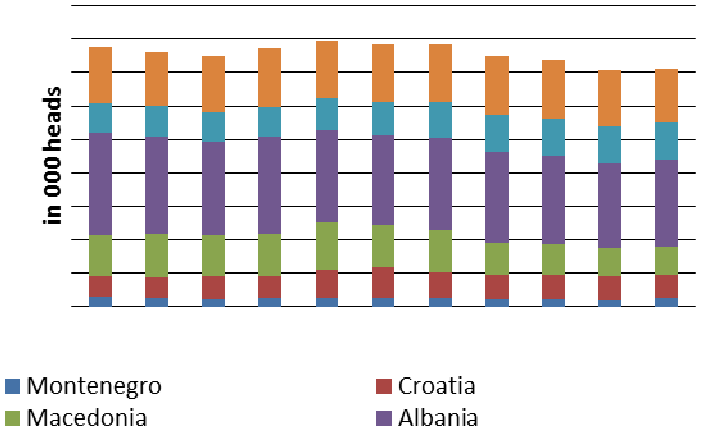
Figure 18: Pig stock in WB countries



Source: Eurostat

Pig stock displays a different dynamics than the cattle stock, mostly due to an extensive production in Serbia and to a lesser extent in Croatia. The pig elevation has a very long tradition in some of the WB countries, notably in Serbia, driving an intense domestic demand for these products. Unlike the pig stock, the sheep and goat stock is clearly decreasing since 2006. Albania is the regions' leading producer, probably given its' hilly and mountainous environment. Serbia is, after Albania, the most important producer.

Figure 19: Sheep and goats stock in WB countries



Source: Eurostat

WHERE NEXT? PERSPECTIVES OF WB AGRICULTURE.

In the previous parts, we have juxtaposed the macroeconomic situation with the role of agriculture within the economies of the WB. As we have seen, the two major challenges of most of WB economies, if not all, are the persistent unemployment and a traditional CAD. As a result, all WB economies are very fragile and their growth (if any exists since 2008) is very unsustainable. Hence, a shift towards net export / FDI driven growth should be promoted, so that the WB economies might absorb the idle workers (reduce unemployment) and impede/reverse the CAD (in order to shift the growth to a sustainable path). In this respect, agriculture may be an engine of growth, albeit only auxiliary. The trends started in the 2000's (abruptly ceased in 2008) include (i) diminution of the agricultural contribution to GDP, (ii) diminution of the agricultural employment within the total employment, all in presence of (iii) growing productivity of the agricultural sector. However, the trend seems to be frozen, with agriculture reaching its limits, because of (i) faltering domestic and external demand and (ii)

overly weather – reliant, low technology production. The leap forward is found in moving up the value chain, meaning that the agricultural products portfolio should diversify, in order to include some more sophisticated products. Moreover, agricultural productivity should not be regarded as the goal itself, as much as the agriculture sector shouldn't be regarded as the main growth engine in a country, given its generally low GVA. Hence, a viable agricultural sector should be rather a raw material source for the related manufacturing industries (food-processing, beverages, energy, chemicals, etc.).

For these reasons, the productivity being the major challenge for the WB agricultural sector, every reform in augmenting its importance must be pointed to a productivity hike. Indeed, higher productivity will most definitely lead to further diminution of the agricultural employment, but it will generate higher yields, thus securing the raw material basis and/or exporting surpluses that will be more helpful in fighting either unemployment and/or CAD. The rationale for this is that the productivity rise should generate higher amounts of agricultural products, thus yielding either cheaper inputs for the manufacturing industry (hence increasing the manufacturing industry competitiveness, allowing job creation), and/or diverting the excess agricultural yields to exports[13] (thus alleviating the CAD challenge). An additional macroeconomic effect of agriculture productivity is its upshot on the prices[14]; e.g., an average Serbian family spends app. 40% of its income on food-related expenses. A more productive agriculture might break away from its heavy dependence on weather, and with higher yields, it might help gradually diminish food-related upward price pressures.

Hence, agriculture as it is now in the WB is both a part of the problem and of a potential solution. Local political elites are prone in suggesting the agriculture as a main growth engine. However, the WB agriculture as it is now is not in position to be a growth-driver, but merely to shoulder a growth driven by a more diversified number of sectors. However, a robust agricultural sector, having a strong productivity, might, as we pointed out, help reduce the CAD and significantly reduce the food related price volatility. It may, also, indirectly help reduce unemployment, through the mechanism of increased competitiveness in the related manufacturing industries (i.e. food processing, energy sector, etc.). Hence, in order to achieve these goals, the productivity becomes the corner stone of any agricultural strategy. The largest impediment to productivity now is the

[13] An example: Serbia is the world's 6th corn exporter. However, this is a mixed blessing, because the corn exporting success owes to a very small domestic demand (deteriorating cattle stock, inexistent ethanol production).

[14] However, with an anemic GDP growth, inflation seems to be tamed in the WB, and this is why we have not put it in the spotlight among major economic challenges

farm size. We believe in introduction of larger companies in the field[15] attracted by food sector liberalization, as a mean of increasing the farm size. Increased farm size going in sync with a hike in capital formation[16] is directly contributing to a less volatile, more productive agricultural sector.

Although sometimes efficient, we refrain from advising to intensify the government subsidy system (at least not in volume), but rather to make incentives for diversifying the agricultural production (creating a more diversified agricultural products portfolio), and/or allocate incentives for the agricultural production demand side (such as feed-in tariffs for bio-mass electricity plants, thus increasing demand for agricultural products and raising its price).

Hence, based on the two abovementioned opinions, we believe that the only way to increase agriculture productivity in the WB, and to make it (b)reach EU27 norms is in corporatization of the sector and not in an increased government's role in redistributing the tax-payers' financial resources to some arbitrary-selected domains. In our vision, a productive agricultural sector consists of a layer of mid to large size companies that employ a relatively low share of working population, but have a robust capital formation and R&D, all in sync with a high market sensibility. Hence, we believe that the level of corporatization will also be the measure of agricultural success in the WB in the coming period.

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[15] Here we take a pro – liberalization stance in the agri sector, under condition of a gradual, soft landing towards a liberalized agricultural market.

[16] We believe that a company – run large size farm might have an easier access to financing in conventional banking systems, due to a lower information asymmetry of companies in comparison with family – run small scale farms. Ergo, easier access to financing and a more advanced know how of large companies, might allow a higher agricultural capital formation, suggesting also more investments in the field: i.e. more irrigation and machinery.

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