REPORT ON WOOD PELLET PRODUCTION AND MARKET STRUCTURE IN SERBIA

Prepared for:
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
DKTI- Development of a Sustainable Bioenergy Market in Serbia
Boze Jankovica 39
11000 Beograd

Prepared by:
Vojislav Milijić, Foragrobio cc doo
Blaska Rajica 27/70, Subotica

September 29th, 2014
# Table of Contents

List of tables .......................................................... 4
List of figures ........................................................... 4
List of charts ............................................................ 5
List of abbreviations ................................................... 5

## Table of Contents

1. Executive summary .................................................. 4
2. Definition of tasks ................................................... 5
3. Methodology ......................................................... 6
4. Wood Pellet Production in Serbia ................................ 8
   4.1. Wood Pellet Production Development in Serbia ....... 8
   4.2. Raw Material Supply ......................................... 10
   4.3. Wood Pellet Production Capacities ....................... 13
   4.4. Wood Pellet Quality ........................................ 21
5. Wood Pellet Market Structure .................................. 23
   5.1. Export ......................................................... 24
   5.2. Domestic Market ............................................ 27
6. Issues in Wood Pellet Production, Business and Market .... 30
7. Conclusions ......................................................... 32
   7.1. Wood pellet producers’ typology ......................... 32
   7.2. Tendencies in wood pellet production and market development .... 34
   7.3. Obstacles for wood pellet production and market development .... 36
   7.4. Recommendations for wood pellet production and market development .... 38
8. Sources ............................................................. 40
9. Annexes .............................................................. 44
   9.1 Annex I: Wood Pellet Production companies in Serbia .......... 44
   9.2 Annex II: Interview questionnaire .......................... 46
   9.4. Annex IV: Specialized Wood Pellet Distributers in Serbia ........ 49

## List of Tables

T-1: Wood Pellet Export Destinations (Quantities and Value) .... 25
T-2: Wood Pellet Import 2012-2014 (Quantities and Value) .... 28

## List of Figures

F-1: Status of Wood Pellet Production Companies in Serbia ........ 9
F-2: Raw Material Used by Pellet Producers ....................... 12
F-3: Wood Pellet Production Capacities ........................... 14
F-4: De-barkers and Wood Chippers ............................... 19
F-5: Dryers ........................................................... 20
F-6: Boilers ........................................................... 20
F-7: Pellet presses .................................................... 21
F-8: Wood Pellet Quality Certificates .............................. 22
F-9: Wood Pellet Packaging ......................................... 22
F-10: Wood Pellet Market Structure Scheme ...................... 23
List of Charts

C-1: Identified wood pellet companies and their response to the survey........................................6
C-2: Opening and Closing of Wood Pellet Plants in Serbia .................................................................9
C-3: Wood Pellet Production, Projected Production and Planned Production in Serbia 2012-2015 ........10
C-4: Raw Material Structure – Wood Species......................................................................................11
C-5: Raw Material Structure – Wood Products.....................................................................................11
C-6: Raw Material Suppliers ..................................................................................................................12
C-7: Structure of Interviewed Pellet Producers’ on Installed Hourly Capacity ......................................15
C-8: Daily Engagement of Pellet Producers .........................................................................................15
C-9: Engagement of Pellet Producers in Working Days per Year .........................................................16
C-10: Installed Annual Production Capacities .......................................................................................16
C-11: Utilization of Production Capacities .............................................................................................17
C-12: Producers Claims on Pellet Quality.............................................................................................21
C-13: General Market Structure for Wood Pellet Produced in Serbia ..................................................24
C-14: Wood Pellet Export Destinations for 2014 ....................................................................................25
C-15: Wood Pellet Export Destinations’ Share 2012-2014 .................................................................26
C-16: Buyers of Exported Wood Pellets 2014 .......................................................................................26
C-17: Wood Pellet Export Price 2012-2014 ............................................................................................27
C-18: Wood Pellet Import Origin share 2012-2014 ..............................................................................29
C-19: Domestic Buyers of Wood Pellets from Pellet Producers 2014 ....................................................29
C-20: Wood Pellet Producers’ Typology ...............................................................................................33

List of abbreviations

BMZ German Federal Ministry for Economic Cooperation and Development
CHP Combined Heat and Power
COC Chain of Custody
DH District Heating
DIN Deutsches Institut für Normung
DKTI Deutsche Klima Technologie Initiative
EN European Norms
EU European Union
EUR, € Euro
EXW Ex-Works
FSC Forest Stewardship Council
GIZ Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
GIZ-DKTI Program for the “Development of a sustainable Bioenergy Market in Serbia”
ha hectare
kg kilogram
mm millimetre
m³ cubic meter
MW Megawatt
PE Public Enterprise
Ton, t metric ton
VAT Value Added Tax
WB Western Balkans
1. Executive summary

Wood pellet production and market in Serbia started to develop in 2007 and 2008 and until 2012 major portion of wood pellet production was exported mainly to Italy and other EU countries. However, increase of demand for wood pellet in EU, Western Balkans and domestic market resulted in increase of production capacities, affecting wood pellet production increase from bellow 100,000 tons in 2012 to over 300,000 tons as projected for 2014. Major portion of wood pellet produced in Serbia is still being exported (70%), nevertheless domestic market pellet consumption grows every year and it is expected that domestic consumption will reach 90,000 tons in 2014. Average utilization of wood pellet capacities is 50%, while biggest number of active pellet producers (51%) has installed capacities lower than 1 ton per hour, while 38% of producers have installed capacities between 1 and 4 tons per hour. Only a few (6%) pellet producers have installed capacities of 4-8 tons per hour, and few (4%) producers have installed capacity over 8 tons per hour. Wood pellet producers seem confident in their product quality, while only few producers are EN plus certified. Most of exported and domestically sold wood pellet is prepared for household utilization packed in 15 kg bags and wrapped on pallets and sold to fuel distributors, although some distributors and industrial buyers buy pellets packed in jumbo bags as well. Average EXW price of wood pellet for export developed from 140 EUR in 2012 to 160 EUR per ton in 2014. Domestic prices of wood pellets are usually 5-15% higher than export prices. In 2012, EXW price of pellet for domestic market ranged from 150 to 180 EUR per ton, without VAT, while in 2013 EXW price ranged from 140-190 EUR per ton and it should remain similar in 2014.

Most important issues in wood pellet production encompass: raw material supply, production process and general business environment. Four types of wood pellet producers can be classified: wood processors, small scale, medium scale and large scale, with medium scale as most abundant. These groups have different raw material procurement, production process and production capacities, thus they are facing different types of issues and have different prospects for further development. Major tendencies in wood pellet production and market development, in wood pellets’ producers economic situation and in depletion of raw material, are analyzed. Tendencies in development of pellet market in Serbia are: increase of pellet production, export and domestic consumption; reduction of import; dominance of pellet produced for household use; dominance of wood pellet sold to household fuel distributors both in export and domestic market; limited quantities sold to industrial or district heating users; Increase in prices both for export and domestic market; seasonality of prices and wood pellet domestic demand; Increase of pellet quality requirement; and increased interest for certification. Major tendencies regarding production capacities and wood pellet producers’ economic situation are: limited financial resources for further investments and business financing; increased number of bankruptcies, production closing or business sale; dominance of second-hand pelletizing equipment; increase of production costs; limited profitability in wood pellet production. Major tendencies regarding raw material depletion are as follows: increase of demand and supply from state and private forests and wood processing industry; increase of raw material prices; increase of quantity, quality and logistic limitations in raw material supply.

Major obstacles for wood pellet production and market development are: limitations in domestic market development; limited financial resources for investments in pellet production; and limitations on raw material supply. Presented recommendations for wood pellet production and market development include measures aimed in increase of domestic use of wood pellets and market development; measures aimed in provision of technical and financial support to wood pellet producers; and measures aimed in raw material supply improvement and increase. Those measures vary from reduction of VAT and energy efficiency subsidies to change in state forest management organization and support aimed in production increase from private forests.
2. Definition of tasks

Report on Wood Pellet Production and Market Structure in Serbia is developed as activity of the project: “Development of Sustainable Bioenergy Market in Serbia” implemented jointly by KfW and GIZ and funded by German Federal Ministry for Economic Cooperation and Development (BMZ). Consultants’ assignments in completion of the Report consisted of:

- Survey of all wood pellet producers in Serbia to collect information about the installed capacities, the production in 2012 and 2013, the estimated production in 2014 and planned production in 2015;
- Survey of type, quantity and origin of biomass used for pellet production;
- Analysis of export statistics provided by customs and trade information to evaluate information from producers about locally sold quantities and exported ones;
- Survey of suppliers of pellet boilers about sold units in Serbia and estimation of installed capacity to evaluate the information about locally consumed amount of pellets.

Consultants’ tasks consisted of:

- Identification of pellet producers and visit of relevant producers to collect and evaluate information about installed capacity, the production in 2012 and 2013, the estimated production in 2014 and planned production in 2015;
- Collection of information about type, quantity and origin of biomass used for pellet production;
- Provision of overview of the amount of exported wood pellets in past 2 years, based on relevant information provided by pellet producers and other relevant sources;
- Provision of overview of the amount of locally used pellets, the distribution channels and market situation, including prices and price tendencies;
- Retrieval and evaluation of information about probable obstacles, bottlenecks and limits in the pellet market;
- Retrieval of information about the assessment of the further development by producers and traders of pellets.

Report was prepared by Foragrobio CC doo¹ and submitted in September 2014. Survey preparation started in July 2014, while the Survey was conducted in August and September 2014.

¹ http://www.foragrobio.rs/
3. Methodology

Methodology implemented in the survey consisted of following steps:
- related literature and sources review;
- investigation and completion of the list of potential wood pellet producers;
- verification of activity of companies potentially producing wood pellets;
- development of interview questionnaire;
- contacting wood pellet producers and scheduling interviews;
- face to face interviews with wood pellet producers;
- email interviews with wood pellet producers;
- phone interviews with wood pellet producers;
- investigation and completion of the list of wood pellet boilers’, stoves’ and burners’ producers and dealers;
- phone interviews with wood pellet boilers’, stoves’ and burners’ producers and dealers;
- provision of official statistical data from Directorate of Customs of the Republic of Serbia;
- development of data processing scheme;
- data entering;
- data processing;
- data analyzing;
- reporting.

Literature and sources review was focused on obtaining information about wood pellet production, technologies and market in Serbia. Also, reviewed sources were used as a basic ground for completion of potential wood pellet producers’ list. Upon completion of potential wood pellet producers’ list, existence and activity of those companies was verified in Agency of Commercial Registry\(^2\) based on their registry number previously investigated in internet sources. After the list completion and verification, pellet producers were contacted and interviews were scheduled. Total of 69 companies involved in wood pellet production were identified and detailed companies’ list is presented in annex II. Chart C-1 shows identified companies’ structure and their response to the survey.

\[C-1: \text{Identified wood pellet companies and their response to the survey}\]

\(^2\) http://pretraga2.apr.gov.rs/ObjedinjenePretrage/Search/Search
From total number of identified companies - 69, there are 3 companies which exist as separate entities but are in fact registered by owners of active companies for performing some specific parts of their core business. These companies are linked to their mother companies. Therefore total sample of identified wood pellet producers was 66. Most of identified companies are active and producing (47). Most of active ones participated in the survey either in face to face interviews (24) or email and phone survey (15). For Survey protocol see annex II. In addition, there are legally active companies which did not yet start the production and are in various primary stages of pellet production development, from feasibility studies to factory location analysis. Those companies were contacted but not interviewed (5). There are a few active pellet producers which did not want to participate in the survey (8). In addition there are several companies which couldn’t be reached (7). For some unreachable companies the production of pellet could not be confirmed on field although some articles about them making contracts for locations and announcement of investments appeared in the media. Moreover, there are several companies which are either in bankruptcy or in the process of deleting from commercial registry and finally several companies which are still legally active but do not produce pellets anymore and have sold their equipment. Companies from last mentioned group (7) were contacted but not interviewed.

After identification of the companies’ interview questionnaire was developed (see annex II) and it consisted of 5 question groups as follows:

- Company data;
- Data on raw material supply;
- Data on production;
- Data on the market;
- Issues with raw material supply, production process, organization and business environment and needed support for business improvement.

Face to face interviews were carried out in the period of 11\textsuperscript{th} to 20\textsuperscript{th} of August 2014. With companies unavailable for face to face interviews but willing to participate in the Survey, interviews were carried out by email or phone in the period of 26\textsuperscript{th} of August to 4\textsuperscript{th} of September. Parallel to phone and email survey with wood pellet producers, investigation of wood pellet consumption in Serbia was carried out. Due to the very large number of wood pellet consumers in Serbia, consumption of wood pellet was determined circumstantially in following manner: wood pellet boilers’, burners’ and stoves’ producers and dealers were contacted for providing the information of number of sold units and their average consumption.

Previously a detailed list of most important wood pellet boilers’, burners’ and stoves’ producers and dealers was completed based on the internet sources. Totally 32 pellet boilers’, burners’ or stoves’ producers or dealers were identified and contacted, and most have agreed to present requested data (see annex III). Also, data of some existing district heating plants which co-fire wood pellet with other solid fuels were included in domestic consumption analysis. Additional data on wood pellet export and import were provided by Directorate of Customs of Republic of Serbia. Developing data processing scheme, data entering, data processing and analyzing was performed from 26\textsuperscript{th} of August to 4\textsuperscript{th} of September, while report writing was performed from 1\textsuperscript{st} September to 5\textsuperscript{th} of September. Report was amended according to GIZ DKTI comments from 27\textsuperscript{th} to 29\textsuperscript{th} of September.
4. Wood Pellet Production in Serbia

As mentioned a total of 69 companies related to wood pellet production were identified in Serbia, while 3 of them can be regarded as special purpose companies linked to mother companies actually producing wood pellets, therefore the total sample of pellet producers in Serbia in this survey counts to 66. Out of those companies a total of 47 or 71% have been confirmed as active producers. Most of those companies 28 (42%) are located in statistical region of Sumadija and Western Serbia, while 15 (23%) of those companies are located in statistical region of Eastern and Southern Serbia. Only 3 (5%) of the companies are located in Vojvodina, while only 1 company (1.5%) is located in Belgrade region. There are 7 of (11%) identified companies which either went into bankruptcy or are in liquidation process or have stopped wood pellet production and closed their pellet business. Contrary to that there are 5 (8%) of identified companies which have plans to start pellet production from next year and are in various stages of preparation from feasibility studies to factory location analysis or procurement. Finally 7(11%) of identified companies could not be reach for this survey, although some of them have been mentioned in the media there is no direct confirmation that they actually exist or started pellet production. Spatial distribution of mentioned companies is presented in Figure F-1.

4.1. Wood Pellet Production Development in Serbia

Wood pellet production in Serbia started in 2007 with opening of one factory in the region of Sumadija and Western Serbia. Pellet production continued to develop in 2008, when 3 more companies were opened. Following two years 5 factories had been opened each year, while only a single factory was opened in 2011. Same year first factory closed its production. In 2012, 9 new factories were opened and 2 were closed, and increasing trend peaked in 2013 when 17 factories or one third of all nowadays active factories were opened. Same year 3 factories were closed. Same trend continues and this year 13 new factories or one quarter of existing factories are completed and started to produce or will start production in days to come. One factory is also closed in 2014. Chart C-2 shows annual share of opening pellet production capacities in Serbia. Compared to countries in the region Serbia has significantly highest number of opened pellet production capacities. Although countries like Romania, Croatia and Bosnia and Herzegovina have more abundant wood resources then Serbia, a number of pellet producers is significantly lower. Based on number of identified companies which plan to start production in future, existing trend in opening pellet factories probably will continue in next year as well.
C.2: Opening and Closing of Wood Pellet Plants in Serbia

F.1: Status of Wood Pellet Production Companies in Serbia
Growth of production capacities in Serbia reflected on the pellet production as well. Chart C-3 shows production of wood pellet factories participated in the survey for 2012 and 2013, along with their projected and target production in 2014 and planned production for 2015.

According to data obtained from interviewed pellet producers their production in 2012 was more than 98,000 tons, and it increased to around 153,000 tons in 2013. So far production in 2014 along with pellet producers plans and projections until the end of the year should reach around 280,000 tons. If we estimate production of companies which refused to participate to the level of around 30-50,000 tons, total production in 2014 should exceed 320,000 tons. Planned production of interviewed pellet producers for 2015, if production capacities are reached and raw material is procured, should exceed 500,000 tons.

### 4.2. Raw Material Supply

Having in mind very large number of wood pellet producers and their capacities, raw material supply can be regarded as potentially critical issue. Structure of raw material supply of interviewed pellet producers is monitored on annual level for 2014 in terms of raw material requirement, raw material structure, wood products they buy and raw material suppliers. Total raw material requirement for interviewed pellet producers in 2014 is **497,000 tons** of wood. Raw material structure is presented in chart C-4.
C-4: Raw Material Structure – Wood Species

Beech is a dominant species of wood pellets are made from, since 84% of all raw material used by interviewed pellet producers is beech firewood or sawmill residues. Beech is followed by spruce and fir – 13% and pine around 2%. Poplar and oak are also presented but combined share of those two species is lower than 1%.

Raw material structure in terms of wood products which pellet producers procure is presented in Chart C-5. Firewood (80%) including firewood and cellulosic wood is a dominant wood product interviewed pellet producers procure. Firewood can be in form of long firewood or in meter length firewood. Solid sawmill residues (12.5%) are second wood product utilized by interviewed pellet producers, and it is followed by sawdust (8%). Forest residues and logs are also utilized but their combined share is lower than 1%.

C-5: Raw Material Structure – Wood Products

Structure of raw material suppliers for interviewed pellet producers is presented in chart C-6, while figure F-2 shows raw material used by some of interviewed pellet producers.
C-6: Raw Material Suppliers

PE Srbijasume is most important raw material supplier to interviewed pellet producers covering 66% of their raw material requirement with mainly firewood and cellulosic wood. Second most important suppliers are sawmills covering 14% of raw material purchase with sawdust and solid sawmill residues.

Small scale forest owners share in supply is around 10% and it is mainly related to meter or long firewood delivery. Around 4% of supply is covered from pellet producers’ own sources, which in all the cases means that such pellet producer also has another wood processing factory and that wood pellet for such is a secondary line utilized for additional source of income and solution for wood processing residues. Around 2% of wood supply comes from national park public enterprises, mainly from NP Tara, which deliver hardwood firewood and conifer cellulosic wood. Less than 2% of supply comes from import, mainly from...
Montenegro and Bosnia from where some producers are importing sawmill residues. Similar share comes from large scale private forest owners such as companies managing forests of Serbian Orthodox Church.

Average raw material supply ratio, meaning required tons of wood for production of 1 ton of pellet is 1.77:1 and it ranges between 1:1 for pellet producers utilizing only dry sawdust and 1.8:1-2:1 using dryers fueled with forest residues, up to 2.5:1 for pellet producers utilizing dryers consuming wood pellet.

### 4.3. Wood Pellet Production Capacities

Pellet producers’ production capacities are often determined by the capacity of pellet presses which are the core part of the factories. Apart from presses other important parts of production lines are hammer mills, dryers, wood chipping units with or without de-barkers along with necessary conveyers, transporting devices, coolers, dust removers and packaging lines. This survey analyzed capacities of major devices in pellet production including: de-barkers, stationary or mobile wood chippers, hammer mills, dryers and presses. Also, boilers for dryers, fuel they use and their consumption have also been analyzed.

Figure F-3 shows hourly capacities of pellets producers.
F-3: Wood Pellet Production Capacities
Total installed capacity of interviewed pellet producers is over 81.5 tons per working hour, however number of working hours per day and numbers of working days per year, varies significantly, resulting in total installed capacity of interviewed pellet producers to amount of 566,000 tons per year. Moreover overall utilization of production capacities of interviewed wood pellet producers in 2014 should be around 50% but utilization of production capacities between producers also varies significantly.

Structure of interviewed pellet producers’ installed hourly capacity is presented in chart C-7.

![chart C-7: Structure of Interviewed Pellet Producers' on Installed Hourly Capacity](chart)

Biggest number of active pellet producers (51%) has installed capacities lower than 1 ton per hour, while 38% of producers have installed capacities between 1 and 4 tons per hour. Only three (6%) pellet producers have installed capacities of 4-8 tons per hour, and there are two (4%) producers with installed capacity over 8 tons per hour.

Structure of interviewed pellet producers’ daily engagement is presented in chart C-8.

![chart C-8: Daily Engagement of Pellet Producers](chart)
Majority of interviewed wood pellet producers (60%) work between 16-24 hours per day, and 28% works 8-16 hours per day, while 8% of interviewed producers work one shift per day or less.

Structure of interviewed wood pellet producers’ engagement in working days per year is presented in chart C-9. Most of interviewed pellet producers – 49% work from 200 to 300 days per year, while 36% of them work more than 300 days per year and only 15% work less than 200 days per year.

### Chart C-9: Engagement of Pellet Producers in Working Days per Year

- **300 and more**: 36%
- **200-300**: 49%
- **200 and below**: 15%

Structure of interviewed wood pellet producers’ installed annual production capacity is presented in chart C-10. Most of pellet producers (21% for each category range) have installed annual capacities of 1,000-5,000, or 5,000-10,000, or 10,000-20,000 or 20,000-50,000 tons per year. Only 12% of interviewed have installed capacities under 1,000 tons per year. Only 6% of interviewed pellet producers have capacities over 50,000 tons per year.

### Chart C-10: Installed Annual Production Capacities

- **Over 10,000,000**: 3%
- **5,000,000-10,000,000**: 3%
- **20,000,000-50,000,000**: 21%
- **10,000,000-20,000,000**: 21%
- **5,000,000-10,000,000**: 21%
- **1,000,000-5,000,000**: 21%
- **1,000,000 and below**: 12%

As previously mentioned, average utilization of installed capacities of interviewed wood pellet producers in 2014 is 50% and chart C-11 shows structure of capacity utilization in 2014 for interviewed wood pellet producers. Most of interviewed producers - 33% is utilizing or should utilize 50-75% of their annual capacities.
in 2014, while 31% utilize over 75% of production capacities. However most of those producers have small installed capacities. Around 21% utilize 25-50% of their capacities while 15% utilize less than 25%. It is important to notice, that most of the factories which production started or should start in 2014 fall in the last category.

![Bar Chart: Utilization of Production Capacities]

In following lines status of specific elements of pellet production technology is analyzed. **De-barkers** are used to peel of the bark from wood and thus reduce bark dirt and bark content eventually leading to reduction of ash content in the pellet. Only 9% of interviewed producers utilize de-barkers.

**Wood chippers** are used for chipping or grinding solid wood into wood chips, enabling its further milling in hammer mills. Wood chippers used by interviewed pellet producers are either mobile or stationary ones. 30% of interviewed pellet producers use stationary wood chippers, and in most cases it is a second hand machine. Most important types of used stationary chippers are Jenz³ and Bruks Klöckner⁴. Around 43% of interviewed pellet producers utilize mobile wood chippers and it is not a rare case that companies own more than one. Most important types of mobile wood chippers they use are: Heizohack⁵ (models HM4/-30 to HM/14-800), Jenz (HEM 561) and Eschlböck⁶ (Biber 7 or 8). Figure F-4 presents de-barkers and wood chippers utilized by wood pellet producers in Serbia. Capacities of wood chippers vary from 1 to 30 tons per hour. **Hammer mills** are machines used for milling the wood chips into wood flour which will later be pressed into pellets. 80% of interviewed producers have hammer mills. In addition 30% of interviewed pellet producers have more than one hammer mill and mills raw material before and after drying. Hammer mills utilized by interviewed pellet

---

⁴ http://www.brukschippers.com/
⁵ http://www.heizomat.de/int/holzhackmaschinen.php?id=heizohack&lang=DEU
⁶ http://www.eschlboeck.at/en
producers include following types: Zeppi\textsuperscript{7}, Bruks\textsuperscript{8}, CPM\textsuperscript{9}, General Dies\textsuperscript{10}, or domestic brands such as Pomak\textsuperscript{11}, EMS\textsuperscript{12} or Pellet Metalac\textsuperscript{13}.

Often pellet factories use reinforced hammer mills used for agriculture product processing. Capacities of hammer mills vary from 1 to 20 tons per hour. \textbf{Dryers} are machines used for drying raw material – wood chips or milled wood to humidity required for pellet producing process. Types of pellet production dryers used in Serbia are rotation, fluid and linear. Most of interviewed producers have dryers, and those who do not are either buying dry sawdust or use residues from their own wood processing capacities and thus use dry material for pelleting. In most cases interviewed producers use rotation dryers – 79\% and types of those are CPM, Kovan\textsuperscript{14}, Pomak, Uniconfort\textsuperscript{15} or second hand dryers previously used in agricultural processing. Fluid dryers are used by 14\% of interviewed producers possessing dryers, while linear are used in 7\% of the cases. All existing linear dryers are Scolari\textsuperscript{16} brand and they are used for drying wood chips contrary to rotation and fluid which dry milled wood. Dryers are presented in figure F-5. Dryers are connected to \textbf{boilers} which produce heat energy necessary for drying process. Power of boilers at interviewed producer varies from 0.5 to 10MW, and depending on the type of heat production they use wood chips, bark and other residues, firewood and some even use pellets. Most often used boiler types are Kovan, Unikonfort, Kirka Suri\textsuperscript{17}, Heizomat\textsuperscript{18} and Fiedler\textsuperscript{19} and very often they use custom made boilers. Average consumption of material used in boilers varies from 0.1 to 0.35 tons of solid fuel for production of 1 tons of wood pellet. Figure F-6 shows some of the boilers used by interviewed pellet producers.

\begin{itemize}
\item \textsuperscript{7} http://www.zepi.it/eng/azienda.cfm
\item \textsuperscript{8} http://www.brukschippers.com/hammer-mills
\item \textsuperscript{9} http://www.cpm.net/
\item \textsuperscript{10} http://www.generaldies.com/index.php
\item \textsuperscript{11} http://www.pomak.rs/
\item \textsuperscript{12} http://www.elektromotor-simon.com/
\item \textsuperscript{13} http://www.peletmetalac.com/
\item \textsuperscript{14} http://www.kovan.ba/index.php/bs/
\item \textsuperscript{15} http://www.uniconfort.com/
\item \textsuperscript{16} http://www.scolarisrl.com/essiccatoi_serie_verticali_sr?Language=en_GB
\item \textsuperscript{17} http://www.kirka-suri.com/index.php
\item \textsuperscript{18} http://www.heizomat.de/int/index.php?id=home&lang=DEU
\item \textsuperscript{19} http://fiedler-zdenek.czechtrade.us/
\end{itemize}
Pellet presses are necessary part in pelletizing technology. Their individual capacity varies from 0.5 to 5 tons per hour, and larger pellet factories usually have several pellet presses. Types of pellet presses used are CPM, Zeppi, MTD, Andritz, Buhler, Munch, General Dies, Matador, Demetra, Berga, Pellet Metalac, Mulz.

Also, second hand Ukrainian and Russian pellet presses used in agricultural processing are also used. Figure F-7 shows pellet presses used in Serbia.

21 http://www.andritz.com/
22 http://www.buhlergroup.com/global/en/home.htm#.VAadCmN4knM
23 http://www.muench-edelstahl-gmbh.de/
F-5: Dryers

F-6: Boilers
It is important to stress that most of the pellet factories in Serbia, even some of those with largest capacities, are partially or entirely based on second hand equipment. Often is the case that equipment is not adequate which reflects on issues with pellet quality and day to day technological problems.

### 4.4. Wood Pellet Quality

Interviewed producers have different statements regarding quality of pellet they make (Chart C-12). Most of them - 46% claimed they are producing wood pellet equivalent to Enplus A2\(^28\) quality while 33% of interviewed producers claims their produce both A1 and A2 and 21% claimed they are producing A1. Some of producers’ certificates are presented in F-8.

---

Only 1 producer claims to have actual En plus A1 certificate and only 3 of them claimed to have actual En plus A2 certificate, while others rely on quality testing issued by domestic quality control organization Jugoinspekt. Few producers claim they are in procedures for EN plus or DIN+ certification. Several are in procedure for FSC COC certificate; however this certificate is not for pellet quality but for assuring utilization of wood material procured in sustainable manner. Wood pellet package with quality indications is presented on figure F-9. Interviewed producers seem confident in their product quality since only 23% of interviewed producers confirmed they have customer requests for quality improvement, while 60% of interviewed producers claimed that they give pellet quality guarantees.

F-9: Wood Pellet Packaging

---

http://www.pelet.org/index.php/sr/sertifikati
30 http://www.jugoinspekt.com/
31 http://www.dincertco.de/en/
5. Wood Pellet Market Structure

Wood pellet market in Serbia started to develop when first pellet factories were established in 2007 and 2008. However until 2012 major portion of wood pellet production was exported mainly to Italy and other EU countries. However, increase of demand for wood pellet in Italy along with emerging demand from new markets such as Greece and other neighboring countries and domestic market resulted in increase of production capacities. Major portion of wood pellet produced in Serbia is still being exported nevertheless domestic market pellet consumption grows every year.

General market structure for wood pellet is presented in Figure F-10.

Wood pellets produced in Serbia is being exported and consumed in domestic market. Also, wood pellets are exported by pellet producers to solid fuel distributors abroad or directly to district heating systems or industrial users. Solid fuel distributors in most cases deliver wood pellet to individual users (households) or sell them to district heating systems or industrial users as well. Wood pellets, consumed in domestic market are also sold by pellet producers to solid fuel distributors or pellet boiler distributors, but also some pellet producers directly sell it to individual users (households). Domestic industrial users and district heating systems buy wood pellets directly from producers. Some very small quantities are being imported and in most cases they are sold to individual users by solid fuel or pellet boiler distributors. General market structure for 2014, according to interviewed wood pellet producers is presented in chart C-13. Expected production of interviewed producers in 2014, as mentioned previously, should reach 280,000 tons, export should reach 205,000 tons (73%), while domestic market is expected to consume more than 75,000 tons (27%).
If production of active producers which refused to participate in the survey is assessed at level of 30,000-50,000 tons in 2014, it can be expected that in optimistic scenario export level reach 240,000 tons and domestic market would consume something less than 90,000 tons of wood pellets produced in Serbia.

C-13: General Market Structure for Wood Pellet Produced in Serbia

5.1. Export

Market structure of wood pellets produced by interviewed producers in 2014 in terms of product destination is presented in chart C-14. Italy is the main destination for wood pellet from Serbia in 2014, and it is expected that around 95,000 tons or 46% of total wood pellet export will be exported there. Italy is followed by Slovenia with around 30,000 tons and Greece with similar quantities and 15% share. Around 6% should go to Kosovo (12,000 tons), 5% to Macedonia (10,000 tons), 4.5% to Germany (9,000 tons), 4% to Austria (8,500 tons) and less than 3% to Montenegro (5,500 tons), while below 1% is expected to be exported to Switzerland (1,000 tons) and other countries namely Bulgaria and Turkey.
As mentioned additional sources were used for determination of pellet market structure and one of them was provision of official data from Directorate of Customs of Republic of Serbia\(^34\) on export and import of wood pellet, product which have official custom tariff code 4401310000. Although data were requested from 2008 to 30.06.2014, a special tariff custom code for wood pellet was introduced in 2012, therefore data from 2012 onward were provided.

Table **T-1** shows absolute figures for monitored export with export destinations for 2012, 2013 and for first half of 2014, while chart **C-15** shows relative share of export destination in 2012, 2013, 2014, according to official data from Directorate of Customs. Absolute figures presented in **T-1** are in line with data provided by interviewed producers and presented in chart **C-3**, especially if production data from pellet producers which refused to participate in the survey are added.

<table>
<thead>
<tr>
<th>Destination</th>
<th>2012 Quantity tons</th>
<th>2013</th>
<th>2014</th>
<th>2012 Value EUR</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>46</td>
<td>11</td>
<td>0</td>
<td>6,930.00</td>
<td>1,620.78</td>
<td>0.00</td>
</tr>
<tr>
<td>Austria</td>
<td>48</td>
<td>515</td>
<td>759</td>
<td>6,297.56</td>
<td>63,099.40</td>
<td>77,091.39</td>
</tr>
<tr>
<td>B&amp;H</td>
<td>0</td>
<td>246</td>
<td>24</td>
<td>285.00</td>
<td>30,403.05</td>
<td>2,400.00</td>
</tr>
<tr>
<td>Belgium</td>
<td>0</td>
<td>25</td>
<td>0</td>
<td>0.00</td>
<td>3,441.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>1,584</td>
<td>339</td>
<td>72</td>
<td>212,115.92</td>
<td>45,513.79</td>
<td>10,988.25</td>
</tr>
<tr>
<td>Germany</td>
<td>0</td>
<td>120</td>
<td>2</td>
<td>0.00</td>
<td>24,241.42</td>
<td>780.75</td>
</tr>
<tr>
<td>Greece</td>
<td>9,470</td>
<td>16,198</td>
<td>3,836</td>
<td>1,397,843.52</td>
<td>2,372,078.40</td>
<td>570,814.97</td>
</tr>
<tr>
<td>Croatia</td>
<td>0</td>
<td>143</td>
<td>50</td>
<td>0.00</td>
<td>21,101.85</td>
<td>5,077.50</td>
</tr>
<tr>
<td>Italy</td>
<td>27,593</td>
<td>51,362</td>
<td>20,660</td>
<td>4,022,428.52</td>
<td>8,814,729.56</td>
<td>3,617,440.75</td>
</tr>
<tr>
<td>Lithuania</td>
<td>0</td>
<td>24</td>
<td>0</td>
<td>0.00</td>
<td>3,840.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Montenegro</td>
<td>1,754</td>
<td>3,181</td>
<td>768</td>
<td>251,975.31</td>
<td>465,895.98</td>
<td>109,265.85</td>
</tr>
<tr>
<td>Macedonia</td>
<td>6,777</td>
<td>8,698</td>
<td>6,729</td>
<td>867,220.57</td>
<td>1,124,797.06</td>
<td>997,253.27</td>
</tr>
<tr>
<td>Malta</td>
<td>0</td>
<td>362</td>
<td>48</td>
<td>0.00</td>
<td>55,545.00</td>
<td>7,245.00</td>
</tr>
<tr>
<td>Slovenia</td>
<td>2,970</td>
<td>19,421</td>
<td>4,780</td>
<td>796,315.76</td>
<td>3,311,860.79</td>
<td>848,591.58</td>
</tr>
<tr>
<td>San Marino</td>
<td>0</td>
<td>121</td>
<td>0</td>
<td>0.00</td>
<td>24,966.25</td>
<td>0.00</td>
</tr>
<tr>
<td>Kosovo</td>
<td>2,705</td>
<td>2,226</td>
<td>3,760</td>
<td>355,980.90</td>
<td>278,811.56</td>
<td>526,266.15</td>
</tr>
<tr>
<td>Total</td>
<td>52,946</td>
<td>102,991</td>
<td>41,489</td>
<td>7,917,393.06</td>
<td>16,641,945.89</td>
<td>6,773,215.46</td>
</tr>
</tbody>
</table>

**T-1: Wood Pellet Export Destinations (Quantities and Value)**\(^35\)

Export in 2012, 2013 is on the level of 60-70% of total production and that trend is continued. It is important to notice that **T-1** for 2014 provided only exported volumes until 30.06.2014, and export should rise significantly considering the fact that September, October, November and December are months when most wood pellets are sold. Also, data provided from Directorate of Customs on relative shares of exported wood pellet to certain countries correspond to data provided from interviewed producers. Italy is dominant, followed by Slovenia and Greece, thus there are major discrepancies between order and share of destinations such as Macedonia and Kosovo. Chart **C-16** presents shares of different wood pellet buyers in export of interviewed producers. Household solid fuel distributors with 78% share are major buyers, followed by industrial users (21%), and minor share of District Heat systems (1%). Most of exported wood pellet is packed in 15 kg bags and wrapped on pallets, although some distributors buy pellets packed in jumbo bags as well.

---

\(^{33}\) According to interviewed wood pellets' producers  
\(^{34}\) [http://www.upravacarina.rs/cyr/Informacije/Stranice/Statistika.aspx](http://www.upravacarina.rs/cyr/Informacije/Stranice/Statistika.aspx)  
\(^{35}\) Official data of Directorate of Customs of Republic of Serbia
Large portion of distributors provide own packaging and branding to pellet producers. Industrial users and DH systems buy wood pellet in jumbo bags.

C-15: Wood Pellet Export Destinations’ Share 2012-2014

C-16: Buyers of Exported Wood Pellets 2014
Price of wood pellet for export was gradually growing from 2012 to nowadays as it is presented in Chart C-17. There is a general practice of producers to have different exporting prices in summer and winter months.

EXW\textsuperscript{36} price in 2012 for export varied from 125 EUR per ton in summer to 150 EUR per ton in the winter, where most of producers had price of around 140-150 EUR per ton. When value of export form T-1 is divided with exported quantities, a price of 149 EUR is determined as the average for 2012. However, the value of exported pellet, do not necessarily correspond to EXW parity price. EXW price in 2013 varied from 135 EUR per ton to 175 EUR per ton, where most of producers have price in range of 150-160 EUR per ton. Average price calculated according to Directorate of Customs data in 2013 is 162 EUR per ton. Considering that peak season in 2014 have not started yet, prices range from 120-170 EUR per ton, with most having price in range of 145-165 EUR per ton but majority of interviewed producers have either already raised summer prices or expect to raise prices from September 5-10%. Average price calculated according to Directorate of Customs data in 2014 so far is 163 EUR per ton.

5.2. Domestic Market

Domestic market is gradually growing. And it seems it is not growing on the account of reduced export but on increased pellet production. As presented in chart C-13, interviewed pellet producers expect that domestic market should consume 27% of their total production or around 75,000 tons. As mentioned if assessed that producers which did not participate in the survey will sell up to 20,000 tons in domestic market, total domestic consumption should be expected at level of 90,000-95,000 tons. Additional to interviews with pellet producers, pellet boilers, burners and stoves producers and dealers\textsuperscript{37} were also approached with request to provide data on number of sold units and their average pellet consumption, or to give estimation on how much will be 2014 annual consumption of units they produce or sell. Most of them responded and combined pellet consumption, according to them, should be around 66,000 tons. However, several important pellet boilers producers declined to present data and it can be expected that units they sold in domestic market can consume more than 20,000 tons of wood pellet, leaving that total consumption of pellet based on sold and installed boilers capacities should be 85,000-90,000 tons in 2014, which is in line with

\textsuperscript{36} \url{http://en.wikipedia.org/wiki/Incoterms}

\textsuperscript{37} List of interviewed pellet boilers, burners and stoves producers and dealers is provided in annex 3 of this report.
assessments based on data provided by pellet producers. Domestic market relies in most cases on domestic production; however certain amounts of imported wood pellet also appear.

Table T-2 shows data on wood pellet import, while chart C-18 provides relative share of imported wood pellet origin.

Imported quantities of wood pellet are respectively low, and they tend to drop every year. More than 90% of imported wood pellet comes from Bosnia and Herzegovina, while imports from other countries are not significant and can be regarded as trials or individual shipments not exceeding few truckloads in total.

<table>
<thead>
<tr>
<th>Destination</th>
<th>Quantity tons</th>
<th>Value EUR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012</td>
<td>2013</td>
</tr>
<tr>
<td>Austria</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>B&amp;H</td>
<td>3,679</td>
<td>2,554</td>
</tr>
<tr>
<td>Denmark</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>France</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Germany</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Greece</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Hungary</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Croatia</td>
<td>70</td>
<td>71</td>
</tr>
<tr>
<td>Italy</td>
<td>25</td>
<td>0</td>
</tr>
<tr>
<td>Montenegro</td>
<td>76</td>
<td>0</td>
</tr>
<tr>
<td>Poland</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Spain</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Slovenia</td>
<td>27</td>
<td>6</td>
</tr>
<tr>
<td>Slovakia</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>3,918</td>
<td>2,648</td>
</tr>
</tbody>
</table>

T-2: Wood Pellet Import 2012-2014 (Quantities and Value)
As presented in **C-19**, around 62% of wood pellet sold at domestic market by interviewed producers is bought by households’ fuel distributors who deliver them to individual direct users – mainly household. However 28% of domestically sold wood pellet produced by interviewed producers is directly sold to individual users – mainly households. Nevertheless, around 90% of wood pellet produced by interviewed producers is being consumed by households. District heating systems and industry should buy around 5% each of domestically sold pellets from interviewed producers. It can be concluded that most of domestic channels for distribution of wood pellets to households comes from solid fuel distributors. There are several specialized wood pellet
distributers\textsuperscript{38}, mainly in Belgrade area. In addition, wood pellet is becoming regular product in solid fuel shops and storages, while some of pellet producers are developing their own selling networks. It should be stressed that most of interviewed producers which sell wood pellet directly to individual consumers – households have smaller production capacities and some other wood industry products such as furniture, flooring, etc., thus already have retail system in place. On the other hand larger wood pellet producers tend to come in partnerships with boiler producers or are developing dealership organizations for certain pellet boilers’ brands. There is a case from 2013, where a major boiler producer Alfa Plam Vranje\textsuperscript{39}, acquired a pellet factory Forest Enterprise Doljевac. Also, large producers such as Bioenergy Point or Jela Star are producing their own pellet burners or are also dealers for Kozlusan\textsuperscript{40} or Heizomat\textsuperscript{41} wood pellet boilers and other examples of such cooperation also exist. In this way boiler dealers sell wood pellets along with pellet boilers and provide warranties for both boilers and pellets and servicing for boilers.

Domestic prices of wood pellets are usually 5-15\% higher than export prices. In 2012, according to interviewed producers’ claims EXW price of pellet for domestic market ranged from 150 to 180 EUR per ton, without VAT, while in 2013 EXW price ranged from 140-190 EUR per ton and it should remain similar in 2014. On the other hand average importing prices (T-2) are considerably lower since dealers or importers bought it for retail sale and costs of transport from producers’ destinations are not included. In 2012 average import price was 134 EUR per ton, in 2013 it was 133 EUR per ton, and in 2014 it was 144 EUR per ton. Parity of those prices are based on is not sure, but it can be assumed it is EXW at producers’ in origin countries, while additional costs of delivery and import is not included.

6. Issues in Wood Pellet Production, Business and Market

Most important issues regarding raw material supply, production process and general business environment along with needs for support was also a subject of interviews with wood pellet producers.

**Raw material** supply is not an issue for small scale wood pellet producers (hourly capacity bellow 1 t or annual capacity bellow 5,000 t), and for those, which produce pellets out of their own wood processing residues. However, some of those when consider increasing pellet production capacities are aware that supply of raw material in future can be an issue because of the competition. Competition in supply is already and issue for pellet producers buying sawdust or not entirely relying on their own wood processing residues. Medium pellet factories (1-4 t/h, or above 5,000 t/y) have issues in wood supply contracting with state forest managers and cannot entirely rely on private forest owners for wood and sawmills for sawmill residues. Even the largest producers have issues in raw material supply. Usually they have limited contracts with state forest managers and additionally supply from private forest owners and sawmills. However, if they do have contracts for sufficient quantities, supply from state forest managers (PE Srbijasume in most cases) is often problematic in terms of quality, quantity and scheduled delivery.

Special problems are forest road conditions and tender procedures for wood harvesting, which delay production and in time delivery. Some of the large producers did not manage to contract wood with state forest managers, but have to buy wood from wood traders which buy wood from state forest managers. Also there are specific issues related to measurement and the fact that state forest managers are not willing to adapt to selling wood based on mass (in tons) and not on volume (cbm). Other raw material issues are related to raw material prices, transport and conditioning costs, which some of pellet producers consider very high.

\textbf{In production process} almost all producers have day to day technical issues with equipment especially with presses, matrix and rollers and some with hammer mills and dryers. This can be expected since most of the

\textsuperscript{38} List of wood pellets specialized distributers is presented in annex 4

\textsuperscript{39} http://www.forestalfaplam.com/article/forest-pelet.html

\textsuperscript{40} http://www.bioenergy-point.rs/sr/automatski-kotao

\textsuperscript{41} http://www.jelastar.rs/index.php/en/masinee/kotlovi
equipment of interviewed pellet producers is in fact second hand; also plenty of producers have equipment not designed for hardwood such as beech but for softwood or agriculture pelleting products. In addition, there is an issue of spare parts since most of producers use imported machines and have to pre order and wait for spare parts delivery from abroad. In addition, interviewed producers are not satisfied with quality of spare parts produced domestically so have to rely on importing spare parts. Although generally confident in their product quality, several producers recognize that it is very hard to produce good quality pellet and are constantly trying to find technical solutions in production process.

Most of interviewed producers claim they do not have any issues with the market. In fact, most of them claim they can sell much more then they produce. Some specified certain issues, such as competition with pellet producers selling wood pellet in “black” for cash, without registering the sale and without VAT calculated or charged, to direct customers. Some recognize issues in export since it is hard for them to compete for Italian market with Bosnian producers, who are much closer. In addition, some have issues with buyers (mainly from Italy) making contracts for buying pellet in summer, but not accepting it in the season, while some recognize issues of low quality and scarce possibilities to deliver low quality pellet to European market. Some have issues in low demand in spring and summer months which is reflecting on companies’ cash flow.

In terms of general business environment, a large number of interviewed producers mentioned issues with ecological inspection and their requirements in terms of waste management, noise and dust. Also, plenty of interviewed producers had various issues with neighbors because of noise and dust. Some even had protests organized by residents in front of their factories. A lot of producers recognized having financial issues for production facility completion or further investments. Some have troubles financing business activities as well, such as raw material supply.

Other had specific administrative issues with Serbian Electric Company (EPS) in terms of required electricity supply permits and enlargement of installed power. Yet another had specific issues with floods this year, or with buying totally unusable equipment and replacing it all over again. Also, there were general issues mentioned such as unfavorable tax regulations which do not encourage production and work or political interference in the economy in general.

Most of interviewed producers need financial support for equipment renovation or capacity increase. They would prefer to have favorable credit lines or investment partners. Some need more transparent raw material supply procedures when contracting with state forest managers, and some would like to have long term (5-10 years) raw material supply contracts. Others need more quality workforce or development of domestic institutions which can issue accredited pellet quality certificates. Also, some recognized a need of developing measures for domestic market development in terms of reducing VAT for pellet to 10% instead of 20% or providing subsidies for households for installing pellet boilers.
7. Conclusions

7.1. Wood pellet producers’ typology

According to survey results and based on their capacities, raw material supply, market orientation and issues facing them, following types of wood pellet producers can be distinguished (Chart C-20):

- Wood processors who produce pellets as side product;
- Small scale pellet producers;
- Medium scale pellet producers;
- Large scale pellet producers.
C.20: Wood Pellet Producers’ Typology

**Wood processors** produce wood pellets as a side product, while their major products include boards, elements or furniture. Those producers have smaller production capacities, from 0.5-1 tons per hour. However, they use workforce from wood processing in pellet production as well and they usually combine working time for pellet production with wood processing and according to raw material and demand for wood pellets. This means they usually work up to 2 shifts per day but less than 200 days per year. They use their own wood processing residues, or if had expansion of pellet capacities recently, they do buy some sawdust or sawmill residues from other wood processors. Raw material - residues they already have - they do not buy and they do not have additional transport costs. Also, they do not need to compete with other producers for raw material supply, and since all of them have wood processing tradition, their wood supply channels for logs used in their main production are very well developed. Raw material they use is usually without bark, therefore they can produce pellet with lower ash content without additional equipment installation. Also, raw material they use, especially in case of sawdust is already dry and they need neither additional equipment nor additional energy for drying. This material usually goes directly into a hammer mill, without chipping, so other phases in production can be excluded. All of this lead to reduced costs of raw material supply, workforce and production. They have small capacities and installed second hand equipment, thus reducing investments in pellet production equipment, although maintenance, spare parts and brake-downs represent an issue from time to time. For most of producers from this group domestic market is most important and they have direct sale to households which utilize wood pellets. This group of producers although seems small in capacities is gradually developing, with more and more wood processors installing small pellet production capacities every year. Most of them had briquette production capacities prior to pellet production capacities’ installation.

Producers from this group do not have financial issues derived from wood pellet business, although their pellet production can be affected by financial issues derived from their main wood processing business. It can be expected that number of wood pellet producers from this group will continue to increase, although existing producers do not tend to increase their production capacities.

**Small scale pellet** producers have similar capacities as previous group of wood processors usually up to 1 ton per hour, with major difference reflected in fact that they are buying raw material. Most are startups buy entrepreneurs having experience in wood processing, which relied on raw material namely sawdust or sawmill residues, from time when competition for those wood materials was not strong and prices were low. Now, most of them have issues with raw material supply, considering strong competition for raw material and high raw material procurement costs. They rarely work full time and during whole year, due to the lack of raw material or storages thus they adapt their work schedule with pellet demand. Some have issues in financing day to day business and further investments in development. Most have installed second hand or inadequate equipment, thus they are faced with technical issues in terms of maintenance and brake-downs. In terms of market, most rely on domestic demand and have their distribution channels usually to direct customers, nevertheless some do export as well. This is a fragile group and existence of such producers in future will be critical due to the raw material, production and financing issues they are faced with.

**Medium scale** pellet producers are most numerous. They have production capacity from 1 to 4 tons per hour, however often they do not utilize this capacity. Those producers buy raw material, mostly beech firewood and smaller quantities of hardwood or conifer sawdust or sawmill residues. Some have contracts with state forest managers and also buy additional quantities of wood from small or large scale private forest owners. They are faced with mutual competition in raw material supply and usually have issues in procurement of required wood quantities. All of them have complete production equipment consisting of wood chippers, dry or wet hammer mills or both, dryers and presses. However, most have installed second hand equipment and some have installed inadequate pelletizing equipment, therefore are faced with technical issues in terms of maintenance and brake-downs. Most do work three shifts full time and tend to work more than 300 days per year; however utilization of their capacities is often limited with raw material supply and equipment brake-downs. Even though most installed second hand equipment, due to their capacities’ size initial investments
were high and they usually have issues in procuring finances for raw material supply. Production costs are relatively high due to the fact they pay for raw material, raw material transport and have all the production costs considering they have all phases of full production processes from chipping to pelletizing and automatized packaging. Most producers from this group predominantly export with only a few relying on domestic market, but none dedicate most of the production to domestic market. They are also faced with mutual competition in export or with competition for export from producers in neighboring countries, especially from Bosnia and Romania. In addition they become faced with pellet quality issues and prices when exporting. Most of existing pellet producers can be categorized in this group; however most of already closed capacities belong to this group as well. Contrary to previous groups whose owners had experience in wood processing, most of entrepreneurs running factories from this group were rarely previously related to wood processing. In fact most invested capital earned elsewhere in pellet business driven by increased demand for wood pellet in foreign markets. In addition, all foreign investments in pellet production fall in this category. Producers from this group can be considered as vulnerable, due to the fact that they are faced with issues of raw material supply procurement, high production costs, technical and equipment issues, high investment costs and lack of finances for business development. In addition, market issues can face them in future as well.

There are only few pellet producers which can be qualified as large scale. They have capacities over 4 tons per hour and some even more 10 tons per hour and work full time through a whole year, thus their annual production capacity exceeds 30,000 tons. They are active producers and utilize their capacities. Their raw material supply is very organized and they have regular annual contracts with state forest managers but they also buy additional quantities from small scale and large scale private forest owners and sawmills. Some import sawmill residues and some of them have their own sawmills or developed another wood processing or biomass processing business such as wood chips production. But they do not rely on their wood processing residues for raw material supply for pellet production. Due to the scale of their raw material requirement, issues they face in supply are not in contract procurement but in punctual raw material delivery and logistics. Such factories have significant investments in equipment and storages. Their equipment is new or refurbished second hand (usually whole factories bought and reassembled from abroad) and consists of de-barkers (in some cases), wood chippers (stationary, mobile or both), dryers (one or several), hammer mills (usually several), pellet presses (usually several), additional equipment and automatized packaging. Most of them have financial resources for business development and some are entering partnerships for provision of additional investments. Most of their production is exported; however they work actively in developing pellet distribution channels in domestic market as well, either in cooperation with pellet dealers or in cooperation with pellet boilers’ dealers and distributors. Some have their own distribution of pellet boilers as well. Producers in this category can be considered as viable, although, due to the lack of raw material resources, space for development of new capacities of this size is very limited.

7.2. Tendencies in wood pellet production and market development

Major tendencies in wood pellet production and market development can be regarded as follows:

- Tendencies in development of pellet market in Serbia;
- Tendencies toward pellets’ producers economic situation;
- Tendencies in depletion of raw material;

Tendencies in development of pellet market in Serbia are:

- Increase of pellet production;
- Increase of export;
- Increase of domestic consumption;
- Reduction of import;
- Dominance of pellet produced for household use;
- Dominance of wood pellet sold to household fuel distributors both in export and domestic market;
Pellet production is increasing, going from below 100,000 tons in 2012 to over 300,000 tons projected for 2014, while producers’ plans for 2015 should reach or even exceed 500,000 tons. However, there are limitations for pellet production increase especially in terms of raw material supply, financial and production issues. Export is also increasing which corresponds to production increase, in addition shares of export destinations remains relatively stable with Italy as dominant, nevertheless share of non EU Western Balkan counties (Macedonia, Kosovo, Albania, Montenegro) as export destinations is rising. Reasons beside this fact can lie in unfavorable quality of wood pellet and more quality demands from EU countries with developed pellet market on the other side and lower quality demands in countries where pellet market is just developing. Another reason lies in lower transportation costs to WB countries and less competition from other producing countries such as Bosnia and Herzegovina, Croatia and Romania. Wood pellet exporting prices are growing every year, with emphasized seasonality resulting in prices variation over 10% between spring and autumn months. Most of exported wood pellet is packed in 15 kg bags, wrapped on pallets and sold to household fuel distributers, while share of industrial and district heating systems as buyers remains low but stabile.

Probable reason behind this is that all wood pellet produced in Serbia is 6 mm diameter pellet aimed for household usage, which price makes it uncompetitive for industrial or district heating systems users. A contrary, 6 mm pellet which is eventually sold to DH systems and industrial users is probably of lower quality. Domestic consumption of wood pellet is growing, while on the other side wood pellet import is reducing. Domestic pellet distribution channels are developing and major buyers of wood pellet from factories are fuel distributers; there is plenty pellet distributers and solid fuel sellers already introducing wood pellets in their fuel offer. Large trade chains and supermarkets are also introducing wood pellets in their offer. Nevertheless a large portion of pellet producers, especially small scale ones are selling pellet directly to end consumers. Number of industrial consumers buying wood pellet is also growing, while district heating systems’ usage of wood pellet remains low. Pellet quality demands are rising and most of producers become aware they should provide additional investments in improvement of produced pellet quality in order to maintain or improve their market position, especially in export. With development of domestic market, quality requirement rise and will continue to rise. Some pellet producers recognized this trend and are putting efforts in quality improvement and certificates procurement.

Major tendencies regarding production capacities and wood pellet producers’ economic situation are as follows:

- Limited financial resources for further investments and business financing;
- Increased number of bankruptcies, production closing or business sale;
- Increased number of new pellet producers’ startups;
- Dominance of second hand pelletizing equipment;
- Increase of production costs;
- Limited profitability in wood pellet production;

Most of wood pellet producers, especially small and medium scale have limited financial resources for further investments and day to day business financing. Even the largest pellet producers are facing these issues and are in search for investment partners for expansion and development of their business, while a number of small and medium scale producers are facing difficulties in completion of production capacities, raw material and equipment maintenance financing. This lead to increasing number of pellet producers which faced bankruptcy, closed production or either sold or put their business for sale. Contrary to increased number of
pellet producers out of the business, trend of opening new factories continues. Second hand pelleting equipment and other machinery used by pellet producers are dominant. Whole pellet lines with additional equipment are often bought abroad (Italy, Germany, Sweden, Ukraine, etc.), refurbished and reassembled in Serbia, and there are several traders offering such lines. Even large scale producers combine second hand with new equipment and the share of domestically produced pelleting equipment remains low. This all leads to production costs increase, especially in terms of equipment maintenance, brake-downs and spare parts. Other factor increasing production costs is raw material supply, with firewood and sawmills residues prices going up along with demand increase. Although demand for pellet is growing both for export and domestic market and prices are going up pellet production profitability is limited by constant increase of production costs and investment costs needed for product quality improvement. Profitability is very limited even for wood processors producing pellet out of their own residues, where low raw material costs and investment costs are compensated with relatively higher maintenance costs and smaller production output.

Major tendencies regarding **raw material depletion** are as follows:

- Increase of demand and supply from state and private forests;
- Increase of demand of supply from wood processing industry;
- Increase of raw material prices;
- Increase of quantity limitations in raw material supply;
- Increase of quality limitations in raw material supply;
- Increase of logistic limitations in raw material supply.

In terms of **raw material depletion** it can be concluded that pellet factories in 2014 should consume more than 500,000 m³ of firewood and cellulosic wood in total, or over 400,000 m³ of wood produced by PE Srbijasume, which is 10% of total official wood production in Serbia or 36% of total production of PE Srbijasume or 62% of all firewood and cellulosic wood produced by PE Srbijasume. On the other hand a totally new market for wood processing residues have been developed, with wood pellet producers and chipboard producers constantly increasing demand on one side and development of wood processors own capacities for pellet production on the other. Pellet factories along with chipboard producers such as Kronospan, significantly changed wood market structure and boosted demand for low quality wood in Serbia along with increasing demand for firewood directly used by households. These all resulted in significant increase of quantity limitations in raw material supply on one side, while increase in wood pellet quality requirement increased quality limitations in raw material supply, on the other side. Poor condition or non-existence of forest infrastructure and inadequate tender procedures for harvesting (in state forests) disable forest utilization at the level of annual increment and management plans or affects delivery of contracted raw material, resulting in increase of logistic limitations in raw material supply.

### 7.3. Obstacles for wood pellet production and market development

Major **obstacles** for wood pellet production and market development are as follows:

- Limitations in domestic market development;
- Limited financial resources for investments in pellet production;
- Limitations on raw material supply.

Domestic consumption is growing, it can be expected that pellet consumption in Serbia will continue to rise, in spite of relatively higher prices of wood pellets compared to other fuels and Serbian challenging economic situation reflected in general decline of living standard. However, conformity and energy efficiency are

---


43 [http://www.srbijasume.rs/proizvodi1.html](http://www.srbijasume.rs/proizvodi1.html)

44 [http://www.kronospansrb.rs/](http://www.kronospansrb.rs/)
properties which increase interest for wood pellets and their utilization. As mentioned, domestic market for wood pellet is growing not on the account of reduced export, but on the account of increased production capacities. Although wood pellet producers have better prices, selling pellet in domestic market, medium and large scale producers cannot rely solely on domestic market due to domestic market seasonal character and absorb capacity. Due to the lack of raw material resources, as domestic market grows it can be expected that exported quantities will be reduced. Nevertheless, domestic market expansion can be limited with consumers’ purchasing power and it is questionable when this limit will be met, especially since foreign demand for wood pellets is rising and continues to rise constantly resulting in increase of prices. In such conditions it is questionable if measures such as reduction of wood pellet VAT or subsidies for installation of wood pellet boilers can really increase domestic consumption. And even if they can it is questionable whether export quantities will be reduced or wood pellet import will be increased since space for new wood pellet capacities in terms of raw material supply in current forest management system is very limited.

As mentioned plenty of pellet producers in Serbia are faced with limited financial resources for investments in pellet production, and this issue is often a result of inadequate approach in investment and production planning. This is especially the case with medium size capacities developed by entrepreneurs without previous experience in wood industry and without consulting wood processing or pellet production experts. Often pellet plants are developed based on increased demand for wood pellet and without previous feasibility studies and without raw material supply contracts.

In number of cases after initial investments in equipment, in most case second hand, entrepreneurs becomes financially exhausted when it comes to equipment maintenance and raw material supply financing. This is especially problematic due to wood pellet seasonality features in terms of demand and prices, which requires financial resources throughout the year and most incomes in autumn and winter.

Wood pellet producers’ limited financial resources directly affect production output, utilization of production capacities and wood pellet quality and have indirect effect on the pellet market development as well. Some pellet producers have bankrupted, some closed their production while some already sold their pellet business, or sold part of the business to investment partners. For most financing problems still remain obstacles for further development.

Major and most challenging obstacle for development of wood pellet production is limitation in raw material supply. As mentioned, beech firewood from state forests (PE Srbijasume) is a major raw material for wood pellet producers in Serbia, followed by significantly smaller share of beech wood from private forests or sawmill residues. Possibilities to increase wood pellet production in Serbia in terms of raw material supply from PE Srbijasume are very limited, although there are possibilities to increase supply from private forests, while possibilities to increase utilization of sawmill residues are also very limited, especially since more and more wood processors start to produce wood pellet. On the other hand demand for firewood for household heating and chipboard production is also very high. Special issue lies in the fact that both state forest and private forests have poor condition or non-existence of forest infrastructure which disable forest utilization at the sustainable level of annual increment or even at the level of actual forest management plans. Although there is a lack of raw material for wood pellet to purchase, Serbian forests are underutilized, due to organizational issues and inefficiency in forest management from both state forest managers and private forest owners. Additional obstacle for private forest owners is lack of extension and independent service provision resulting in underestimation of private forest condition and planned harvests; and inadequate support for private forest owners’ organizations resulting in inability of small scale forest owners to put significant quantities on the market via unique local or regional associations. On the other hand large scale

---

45 Professional and technical services for private forest owners, encompassing: tree marking, forest management planning, issuing of wood transport certificates and others are provided by State forest managers. PE Srbijasume provides professional and technical services in over 90% of private forests in Serbia.
forest owners, such as Serbian Orthodox Church and their forest managers have already reached maximum of their production capacities.

7.4. Recommendations for wood pellet production and market development

Following activities and measures for wood pellet production and market development can be recommended:

- **Measures aimed in increase of domestic use of wood pellets and market development:**
  - Reduction of VAT for wood pellet from 20% to 10% and control of pellet producers selling pellet domestically without VAT;
  - Energy efficiency subsidies or favorable credit lines for wood pellet boilers installations in industrial objects, touristic objects and public buildings (schools, retirement homes, hospitals, etc.);
  - Development of domestic bodies for wood pellet standardization and certification;

- **Measures aimed in provision of technical and financial support to wood pellet producers:**
  - Lowering referent interest rates and provision of favorable credit lines for wood pellet production development;
  - Introduction of pellet production permits and definition of requirements for construction and development of pellet production;
  - Development of wood pellet production professional associations and consulting activities;

- **Measures aimed in raw material supply improvement and increase:**
  - Changes in state forest management practice oriented toward increase of forest management efficiency and wood production;
  - Development of independent forestry professional service providers for private forest owners and private forest owners’ organizations aimed in increase of forest management efficiency and wood production;
  - Investments in forest infrastructure.

Reduction of VAT for pellet is one of the first measures already proposed\(^{46}\) for increase of wood pellets’ **domestic consumption and market development**. Although domestic consumption is already increasing without this incentive, benefits from this measure can be expected in reduction of wood pellet prices for end consumers and possible households’ substitution of inefficient coal and wood boilers with pellet boilers. In this way households’ demand on raw firewood can be reduced. Reducing of VAT has to be followed with more efficient control of pellet producers and traders selling wood pellet for cash in gray market. Energy efficiency subsidies or favorable credit lines for wood pellet boilers installations in industrial objects, touristic objects and public buildings such as schools, retirement homes, hospitals, and other, can bring benefits similar to VAT reduction. By encouraging installations of efficient wood pellet boilers in industrial and other objects, substitution of expensive oil, gas or inefficient coal or firewood can be achieved. Substitution of raw firewood will again result in increase of raw material base for wood pellet production or other types of biomass to energy production. Finally, development of wood pellet market has to be followed with adequate activities in quality standardization and certification, and also awareness rising and basic public and media education about types of pellets and pellet quality.

Provision of favorable credit lines for pellet production development can be recommended as measure aiming in provision of **technical and financial support** to wood pellet producers. This measure is related with reduction of referent interest rate as a measure of economic policy needed for general production development. These measures can support feasible wood pellet production projects or already sustainable

---
wood pellet production businesses in order to overcome issues derived from lack of financial resources for additional investments. Current number of wood pellet producers in Serbia is higher than number in whole of Western Balkans combined or higher than number of producers in Romania, although Croatia, Bosnia and Romania each have considerably more abundant forest resources and raw material base for pellet production than Serbia. Since wood pellet is an energy product, for which production other energy sources are consumed, introduction of pellet production permits and definition of requirements for construction and development of pellet production capacities can be recommended. Large number of wood pellet producers and their raw material requirement already disable development of biomass CHP or DH projects, which can be more beneficial to energy stability and economic situation than predominantly export oriented wood pellet production. For improvement of wood pellet production activities support to biomass or wood pellet producers associations can be recommended.

Measures aimed in raw material supply increase and improvements are crucial. Increase of pellet production capacities and increase of utilization of biomass for energy in terms of raw material supply can be possible and sustainable if changes in state forest management organization are introduced and if efforts in enabling private forest owners' organizations activities are made. In both cases it is necessary to provide investments in forest infrastructure. PEs for forest management, such as Srbijasume, have a legal mandate to manage state forests, however their efficiency in forest management and wood production is questionable, especially since 2006, when they sold all of harvesting equipment and are left without any production capacities and totally dependent of harvesting contractors.

On the other hand, wood supply contracting procedures are not transparent and even large scale pellet producers with long term contracts have issues in wood supply quantities, quality and delivery timing. Forest management PEs rely on state subsidies for forest roads construction, afforestation and other activities, and even with state support, condition of forest infrastructure is very poor and often disable realization of forest management and wood production plans. There are numerous ways to effectively organize forest management especially in state forests: from centralization, professionalization and wood production organized and performed by state company managing the forests; through decentralization and establishment of state or municipally owned forest companies managing forests and producing wood on regional or municipal level; to privatization of companies managing state forests or forest management concessions awarded to wood processing industry with strong forestry inspection control over management operations. It cannot be expected that State can continue subsidizing forest management public enterprises thus financial resources necessary for investments in forest infrastructure can be obtained either from commercial credits or from privatization or possible concessionaires.

On the other hand, raw material supply can be increased and improved if efforts are made in enabling private forest owners to increase their production. Individual private forest owners are already dominant suppliers’ of firewood to the market and wood pellet producers are constantly increasing private forest owners’ supply share. Nevertheless, professional services for private forest owners, in forest management are still at the hands of state forest managers, who are procuring those services to private forest owners. This position of state forest companies exclusively providing forest management services to private forest owners can be regarded as a conflict of interest and extension of monopoly in market condition regulations. Moreover, state forest companies are paid by the state to provide these services to private forest owners, but have no interest in encouraging development of private forest owners’ forest management, but to control possible competition. Independent professional service for private forest management performed by private forest management consultants can be beneficial to private forest owners and can enable increase of production from private forests. This service can be organized or supported by private forest owners’ organizations aiming in forest management improvement, improvement of forest infrastructure and wood production increase and joint wood sale.
8. Sources

http://ecopell.rs/vesti.html
http://ekostar-kotlovi.com/
http://fiedler-zdenek.czechtrade.us/
http://mbgorionik.com/
http://pelet.co.rs/
http://peletcentar.rs/
http://pretraga2.apr.gov.rs/ObjedinjenePretrage/Search/Search
http://proizvodnja-peleta.com/kontakt/
http://timsistem.rs/pelet-peci.html
http://totalpellet.rs/
http://www.abcproizvod.rs/o-nama.html
http://www.alfaplam.rs/
http://www.andritz.com/
http://www.benevento.rs/
http://www.bioenergy-point.rs/
http://www.bioenergy-point.rs/sr/automatski-kotao
http://www.briket.co.rs/kontakt/
http://www.brukschippers.com/
http://www.brukschippers.com/hammer-mills
http://www.buhlergroup.com/global/en/home.htm#.VAadCmN4knM
http://www.bukovpelet.com/
http://www.centrometal.hr/
http://www.centrometal.hr/
http://www.cpm.net/
http://www.danolparket.rs/
http://www.demetra-srl.it/english/gruppi_di_filtraggio.html
http://www.denergy.rs/
http://www.dincertco.de/en/
http://www.dnd-pelet.ls.rs/rs/
http://www.drinaitalwoodgroup.com/Home/Index
http://www.ecopellets.rs/
http://www.ecowood.ls.rs/rs/
http://www.ekapija.com/website/sr/company/preview/113399/Bio-Brik-d-o-o-Valjevo
http://www.ekapija.com/website/sr/page/818189/Super-Pellets-uskoro-po%C4%8Dinje-proizvodnju-peleta-u-Mero%C5%A1ini-Kineski-investitor-planira-izvoz-u-Italiju-i-Gr%C4%8Dku
http://www.ekonatim.rs/onama.html
http://www.eko-studenica.ls.rs/rs/
http://www.elektrimotor-simon.com/
http://www.energetskiportal.rs/ministar-energetike-zorana-mihajlovic-posetila-fabriku-peleta-u-zajecaru/2688
http://www.energopelet.ls.rs/rs/
http://www.enplus-pellets.eu/consumer/qa/
http://www.eschlboeck.at/en
http://www.euro-pellet-plus.ls.rs/rs/o-nama.html
http://www.foragrobio.rs/
http://www.forestalfaplam.com/
http://www.forestalfaplam.com/article/forest-pelet.html
http://www.generaldies.com/index.php
http://www.gold-pelet.ls.rs/rs/
http://www.gorstak-bajina-basta.ls.rs/rs/
http://www.gotapellets.rs/o-nama.php
http://www.heizomat.de/int/holzhackmaschinen.php?id=heizohack&lang=DEU
http://www.heizomat.de/int/index.php?id=home&lang=DEU
http://www.it-pellet.ls.rs/rs/
http://www.iverica.rs/
http://www.jevticnamestaj.com/index.php/o-nama
http://www.jugoinspekt.com/
http://www.kepo.rs/proizvodni-program/hibro-pec-na-pelet/
http://www.kgh.co.rs/kotlovi-na-pelet/
http://www.klasterdp.rs/pregled-clanova/41-drvopromet-d-o-o
http://www.kmdcompany.com/o%20nama.htm
http://www.kolarevic.co.rs/ser_kontakt.html
http://www.kotlovi.peletmetalac.com/
http://www.kovan.ba/index.php/bs/
http://www.kovan.ba/index.php/bs/
http://www.kronospansrb.rs/
http://www.ksr.rs/kontakt/
http://www.legus-energy.ls.rs/rs/
http://www.magmontpirot.rs/
http://www.magnus.co.rs/pelet.htm
http://www.mbs.rs/MBS_pelet_sr.html
http://www.megal.co.rs/page4.php?view=preview&image=1&category=0
http://www.miboropellet.com/
http://www.midxk2.rs/en/
http://www.miraja-pellet.rs/
http://www.moca.rs/
http://www.mojakompanija.com/szr-amb-stil/
http://www.muenchedelstahl-gmbh.de/
http://www.namestaj4m.com/onama.php
http://www.nanix-wood.ls.rs/rs/
http://www.ogrev-briketi.com/kontakt.html
http://www.pelet.org.rs/index.php/sr/o-nama
http://www.pelet.org.rs/index.php/sr/sertifikati
http://www.peletissimo.rs/
http://www.pelet-lug.ls.rs/rs/
http://www.peletmetalac.com/
http://www.pelet-srbija.com/
http://www.pelet-srbija.net/pelet-prodaja-beograd-proizvodnja-peleta/
http://www.peletvasko.ls.rs/rs/
http://www.pelet-vukovic.ls.rs/rs/
http://www.pointint.com/kotlovi-na-pelet.html
http://www.pomak.rs/
http://www.prity.rs/yu/partneri.htm
http://www.progres-vp.co.rs/kontakt
http://www.protem.co.rs/srp/proizvodi.php?gid=20
http://www.radijator.rs/products3.php
http://www.ramdus.com/proizvodi/gorionik-na-pelet/
http://www.ras-pellets.ls.rs/rs/kontakt.html
http://www.rating.rs/rs/bonitet/BIO-PELET
http://www.rating.rs/rs/bonitet/DOO-PELET-ALEKSANDROVAC-PARCIN
http://www.rating.rs/rs/bonitet/EURO-PELLET-SDM
http://www.s-biom.com/
http://www.scolarisrl.com/essiccatoi_serie_Verticali_Sr?Language=en_GB
http://www.serbio.rs/vesti/item/114-pdv-na-pelet-mora-da-se-smanji
http://www.sevar.rs/index_sr.php?strana=o_nama
http://www.sibling.ls.rs/rs/
http://www.slbijasume.rs/proizvodi1.html
http://www.suboticaogrev.com/kontakt.php
http://www.sudex-suvi-do.ls.rs/rs/
http://www.sukom.co.rs/proizvodi/
http://www.swisseco-pellet.ls.rs/rs/
http://www.tehnoserv.com/kontaktehnoserv.html
http://www.termico4.rs/
http://www.termismkm.rs/
http://www.termomont.co.rs/kontakt/
http://www.tf.ni.ac.rs/IPA_Bul_Ser/PDF10.pdf
http://www.tf.ni.ac.rs/IPA_Bul_Ser/PDF10.pdf
http://www.uniconfort.com/
http://www.upravacarina.rs/cyr/Informacije/Stranice/Statistika.aspx
http://www.viessmann.rs/sr/porodicne_kuce/proizvodi/kotlovi_na_drva/Vitoligno_300-P.html
http://www.viktor-pelet.ls.rs/rs/
http://www.vlasinapelet.com/
http://www.webmarket.rs/firma-biotherm-vuckovica-132137
http://www.wood-pellet.ls.rs/rs/
http://www.yupellet.com/w/angler/
http://www.zavarivac.rs/
http://www.zepi.it/eng/azienda.cfm
9. Annexes

9.1 Annex I: Wood Pellet Production companies in Serbia

<table>
<thead>
<tr>
<th>Company</th>
<th>Location</th>
<th>Statistical Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-Energy</td>
<td>Belgrade</td>
<td>Belgrade</td>
</tr>
<tr>
<td>Pelet Vasko</td>
<td>Veliki Crljeni</td>
<td>Belgrade</td>
</tr>
<tr>
<td>Midex k2</td>
<td>Sombor</td>
<td>Vojvodina</td>
</tr>
<tr>
<td>It Pellet</td>
<td>Backa Palanka</td>
<td>Vojvodina</td>
</tr>
<tr>
<td>Angler</td>
<td>Ruma</td>
<td>Vojvodina</td>
</tr>
<tr>
<td>KSR Gradnja</td>
<td>Pancevo</td>
<td>Vojvodina</td>
</tr>
<tr>
<td>Legus Energy</td>
<td>Perlez</td>
<td>Vojvodina</td>
</tr>
<tr>
<td>Biobrik</td>
<td>Titel</td>
<td>Vojvodina</td>
</tr>
<tr>
<td>Pelet Lug</td>
<td>Smederevo</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Eko Wood</td>
<td>Petrovac</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Miboro Pellet</td>
<td>Goulubac</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>KMD Company</td>
<td>Kladovo</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>AMB Stil</td>
<td>Bor</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>DND Pellet</td>
<td>Negotin</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Bioenergy Point</td>
<td>Boljevac</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Nakka</td>
<td>Zajecar</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Sloboda Export</td>
<td>Knjazevac</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Eco Pelets</td>
<td>Nis</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Super Pellets</td>
<td>Merosina</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Forest Alpha Plam</td>
<td>Doljevac</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Viktor Pelet</td>
<td>Leskovac</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Company Name</td>
<td>Location</td>
<td>Region</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>4M</td>
<td>Leskovac</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Verso il Paradizo</td>
<td>Leskovac</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Bland doo</td>
<td>Leskovac</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Vlasina pelet</td>
<td>Vlasotince</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Jablanica EKO</td>
<td>Medvedja</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Total Pellets</td>
<td>Blace</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Wood Pellet doo</td>
<td>Zagubica</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Sudex</td>
<td>Zagubica</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Euro Pellet SDM</td>
<td>Zagubica</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Progres doo</td>
<td>Velika Planina</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Magmont pelet</td>
<td>Pirot</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Swisseco Pellet doo</td>
<td>Loznica</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>S-biom</td>
<td>Loznica</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Pelet Vukovic</td>
<td>Mali Zvornik</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Drina Ital Wood</td>
<td>Bajina Basta</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Gota Pelets</td>
<td>Bajina Basta</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Ras&amp;Pellets</td>
<td>Bajina Basta</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Gorstak</td>
<td>Cajetina</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Gold Pelet</td>
<td>Uzice</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Sevar doo</td>
<td>Pozega</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Eko Pelet Plus</td>
<td>Pozega</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Nanix wood</td>
<td>Nova Varos</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Jela Star</td>
<td>Prijepolje</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Spik Iverica</td>
<td>Ivanjica</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Crown Forest</td>
<td>Ivanjica</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Drvopromet</td>
<td>Ivanjica</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Sibling doo</td>
<td>Sjenica</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Magnus poslovni sistem doo</td>
<td>Kraljevo</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Miraja doo</td>
<td>Kraljevo</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Alm Pelet doo</td>
<td>Kraljevo</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Zlatic doo</td>
<td>Kraljevo</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Benevento UMS doo</td>
<td>Cacak</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>SZR Masino dizajn</td>
<td>Cacak</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Biotherm</td>
<td>Guca</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Pelet Aleksandrovac</td>
<td>Aleksandrovac</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>RIZ Pelet</td>
<td>Brus</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Moca doo</td>
<td>Krusevac</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Danol Parket</td>
<td>Krusevac</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Romanof Capital</td>
<td>Krusevac</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>DND</td>
<td>Varvarin</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Sparrow</td>
<td>Varvarin</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Euro Pellet Plus</td>
<td>Varvarin</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Company</td>
<td>Location</td>
<td>Region</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>Eko Therm</td>
<td>Varvarin</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Energopelet</td>
<td>Paracin</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Bio Pelet doo</td>
<td>Svilajnac</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Paci&amp;Pagliari</td>
<td>Svilajnac</td>
<td>Sumadija and Western Serbia</td>
</tr>
<tr>
<td>Kolarevic</td>
<td>Cicevac</td>
<td>Sumadija and Western Serbia</td>
</tr>
</tbody>
</table>

### 9.2 Annex II: Interview questionnaire

#### 2. Podaci o nabavci sirovina/Data on raw material supply

<table>
<thead>
<tr>
<th>Raw material type (t,%)</th>
<th>Raw material requirement (t/y):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bukva/Beech:</td>
<td></td>
</tr>
<tr>
<td>Jela-smrca/Spruce-fir:</td>
<td></td>
</tr>
<tr>
<td>Boc/Pine:</td>
<td></td>
</tr>
<tr>
<td>Topola/Poplar:</td>
<td></td>
</tr>
<tr>
<td>Hrast/Oak:</td>
<td></td>
</tr>
<tr>
<td>Ostaio/Other:</td>
<td></td>
</tr>
</tbody>
</table>

#### 3. Podaci o proizvodnji/Data on production

- **Kapacitet na sat/Hourly capacity (t/h):**
- **Broj radnih sati dnevno/Working hours per day:**
- **Broj radnih dana godišnje/Working days per year:**
- **Godišnji kapacitet/Annual capacity (t/y):**

### Kapacitet opreme/Equipment capacity

<table>
<thead>
<tr>
<th>Type/Type</th>
<th>Kapacitet/Capacity t/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guljač kore/Bark peeler</td>
<td></td>
</tr>
<tr>
<td>Stacionarni iverač/Stationary wood chipper</td>
<td></td>
</tr>
<tr>
<td>Mobilni iverač/Mobile wood chipper</td>
<td></td>
</tr>
<tr>
<td>Mlin čekićar/Hammer mill</td>
<td></td>
</tr>
<tr>
<td>Sušare/Dryers</td>
<td></td>
</tr>
<tr>
<td>Presa/Preses</td>
<td></td>
</tr>
</tbody>
</table>
### 4. Tržište/Pellet market

#### Gde prodajete/Where do you sell? (t,%)

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Izvoz/Export:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italija/Italy:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kosovo:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grčka/Greece:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Albanija/Alb.:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austrija/Austria:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crna Gora/Montenegro:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nemačka/Germany:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Makedonija/Macedonia:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Švajcarska/Switzerland:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovenija/Slovenia:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Druge zemlje/Other countries:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mađarska/Hungary:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Domaće tržište/Domestic market:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Prodaja direktnim korisnicima/Sale to direct users:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Prodaja stovarištima ogreva/Sale to household fuel distributors:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Prodaja specijalizovanim distributerima peleta/Sale to specialized pellet distributors:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Prodaja toplanama ili sistemima za grejanje/Sale to DH systems:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Prodaja industrijskim korisnicima/Sale to industrial users:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Cena peleta Ex Works/Pellet price Ex Works (EUR/t)

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Izvoz/export</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>domaći/domestic</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 5. Problemi/Issues:

1. Nabavka sirovina/Raw material supply: ____________________________

2. Proizvodni proces/Production process: ____________________________

**Dobavljači/Suppliers**

**Ugovaranje/Contracting**

**Dostava/Delivery**

**Cene/Prices**

---

Kotao za toplotnu energiju/Boiler for heat and power production

Potrošnja energije/Energy consumption

Ukupna godišnja potrošnja struje i toplota/Total annual energy consumption for dryers:

Vrsta i potrošnja energenata za sušare/Type of fuel and consumption for dryers: ____________________________

Realizovana i planirana proizvodnja peleta/Realized and planned pellet production (t/y)

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Struktura kvaliteta peleta/Pellet quality structure (%):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Da li imate zahtev za poboljšanjem kvaliteta/Do you have demand for quality improvement? 

<table>
<thead>
<tr>
<th></th>
<th>Da</th>
<th>Ne</th>
</tr>
</thead>
</table>

Da li ste u procesu sertifikacije ili već imate neki od sertifikata o kvalitetu peleta (Enplus, DIN+, Catas, itd)

Are you in certification process or you already have some certificates of pellet quality (Enplus, Din plus, Catas, etc...)

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vrsta I potrošnja energenata za sušare/Type of fuel and consumption for dryers:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

4. Tržište/Pellet market

4.1. Gde prodajete/Where do you sell? (t, %)

### 4.1.1. Izvoz/Export:

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Izvoz/Export:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Izvoz/Export:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Izvoz/Export:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 4.1.2. Domaći tržište/Domestic market:

1. Prodaja direktnim korisnicima/Sale to direct users: ____________________________

2. Prodaja stovarištima ogreva/Sale to household fuel distributors: ____________________________

3. Prodaja specijalizovanim distributerima peleta/Sale to specialized pellet distributors: ____________________________

4. Prodaja toplanama ili sistemima za grejanje/Sale to DH systems: ____________________________

5. Prodaja industrijskim korisnicima/Sale to industrial users: ____________________________

### 4.1.3. Cena peleta Ex Works/Pellet price Ex Works (EUR/t)

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Izvoz/export:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Izvox/export:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Domaće/Imperial:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

5. Problemi/Issues:

1. Nabavka sirovina/Raw material supply: ____________________________

2. Proizvodni proces/Production process: ____________________________

**Dobavljači/Suppliers**

**Ugovaranje/Contracting**

**Dostava/Delivery**

**Cene/Prices**

---

DKTI (GIZ) Programme "Development of sustainable bioenergy market in Serbia"

Report on Wood Pellet Production and Market Structure in Serbia

---

Page 47 of 49
3. Tržište/Market: ___________________________________________________________________________________________________________

Kupci/Buyers _____________________________________________________________________________________________________

Cene/Prices _____________________________________________________________________________________________________

Plaćanje/Payment _____________________________________________________________________________________________________

4. Organizacija I finansiranje/Organizational issues and financing

Investicija/Investment _____________________________________________________________________________________________________

Poslovno okruženje/Business environment _____________________________________________________________________________________________________

Poreska politika/Taxes _____________________________________________________________________________________________________

Kreditiranje/Credit _____________________________________________________________________________________________________

Radna snaga/Work power _____________________________________________________________________________________________________

5. Kakva vrsta podrške je Vama potrebna da bi unapredili poslovanje/What kind of support you need to improve your business?

___________________________________________________________________________________________________

9.3. Annex III: Wood Pellet boilers, burners and stoves producers and dealers in Serbia

<table>
<thead>
<tr>
<th>Company</th>
<th>Location</th>
<th>Statistical Region in Serbia/Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bosch</td>
<td>Beograd</td>
<td>Belgrade</td>
</tr>
<tr>
<td>Pelet Metalac</td>
<td>Obrenovac</td>
<td>Belgrade</td>
</tr>
<tr>
<td>Vissman</td>
<td>Belgrade</td>
<td>Belgrade</td>
</tr>
<tr>
<td>Ekonatim</td>
<td>Beograd</td>
<td>Belgrade</td>
</tr>
<tr>
<td>Point int</td>
<td>Beograd</td>
<td>Belgrade</td>
</tr>
<tr>
<td>Protem</td>
<td>Beograd</td>
<td>Belgrade</td>
</tr>
<tr>
<td>Kirka Suri</td>
<td>Beograd</td>
<td>Belgrade</td>
</tr>
<tr>
<td>Termomont</td>
<td>Simanovci</td>
<td>Vojvodina</td>
</tr>
<tr>
<td>Tim Sistem</td>
<td>Stara Pazova</td>
<td>Vojvodina</td>
</tr>
<tr>
<td>Herz</td>
<td>Stara Pazova</td>
<td>Vojvodina</td>
</tr>
<tr>
<td>Termico</td>
<td>Stara Pazova</td>
<td>Vojvodina</td>
</tr>
<tr>
<td>Tehnoserv</td>
<td>Subotica</td>
<td>Vojvodina</td>
</tr>
<tr>
<td>MBS</td>
<td>Smederevo</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Alpha Plam</td>
<td>Vranje</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Sukom</td>
<td>Knjazevac</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Termis</td>
<td>Knjazevac</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Ekostar</td>
<td>Knjazevac</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Peletisimo</td>
<td>Leskovac</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>KGH</td>
<td>Zajecar</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Prity</td>
<td>Nis</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>MB Gorionik</td>
<td>Nis</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Ramdus</td>
<td>Zajecar</td>
<td>Eastern and Southern Serbia</td>
</tr>
<tr>
<td>Megal</td>
<td>Bujanovac</td>
<td>Eastern and Southern Serbia</td>
</tr>
</tbody>
</table>
9.4. Annex IV: Specialized Wood Pellet Distributers in Serbia

<table>
<thead>
<tr>
<th>Company</th>
<th>Location</th>
<th>Statistical Region in Serbia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bijev Pelet</td>
<td>Online</td>
<td>Whole Serbia</td>
</tr>
<tr>
<td>Termo shop</td>
<td>Belgrade</td>
<td>Belgrade</td>
</tr>
<tr>
<td>Beocontrol Pelet Centar</td>
<td>Belgrade</td>
<td>Belgrade</td>
</tr>
<tr>
<td>Sam G</td>
<td>Belgrade</td>
<td>Belgrade</td>
</tr>
<tr>
<td>Metal elektro</td>
<td>Belgrade</td>
<td>Belgrade</td>
</tr>
<tr>
<td>Pelet</td>
<td>Online</td>
<td>Whole Serbia</td>
</tr>
<tr>
<td>Pelet centar</td>
<td>Belgrade</td>
<td>Belgrade</td>
</tr>
<tr>
<td>Eagle Lines</td>
<td>Subotica</td>
<td>Vojvodina</td>
</tr>
</tbody>
</table>