

MSc Program
Renewable Energy in Central & Eastern Europe



The Pellet Market in Hungary

Main characteristics of the pellet production and consumption
and a possible way of growth
in Hungary

A Master Thesis submitted for the degree of
“Master of Science”

supervised by
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Affidavit

I, **Zsolt Kazai**, hereby declare

1. that I am the sole author of the present Master Thesis, "The Pellet Market in Hungary – Main characteristics of the pellet production and consumption and a possible way of growth in Hungary", 81 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted this Master Thesis as an examination paper in any form in Austria or abroad.

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Date

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Abstract

The major motivation for writing this work that the author himself works in the renewable energy sector in Hungary, and his first-hand experience has been that the need for information about the utilization of pellets greatly increases especially among the small and medium-size enterprises and on the other hand how little information is yet available.

The core question was how the structure of the Hungarian pellet market looks like at present at all, furthermore what are the opportunities for a start up from the point of view of the technology as well as the supply of raw materials?

Given that it is statistically almost invisible how pellets are used in Hungary, therefore there is minimum amount of data available I had to initiate my own data collection and to carry out questionnaire survey among the market players. In addition, we have carried out personal interviews at several professional events with prominent local and foreign representatives to draw our conclusions.

Our research results show that there are still large gaps in the pellet sector regarding the regulation, education and innovation aspects, on the other hand there seem to be chances at a number of areas for the businesses operating in the Hungarian pellet sector to become international market leaders if they use an appropriate strategy.

As a conclusion we can say that to make the best of all of these opportunities if the players of the pellet sector in Hungary find a common platform, and their grassroots initiatives help them start their own development.

Table of Content

List of tables	4
List of figures	4
Acronyms	5
1. Introduction	6
1.1 Motivation	6
1.2 Objective	6
1.3 Citation of main literature	7
1.4 Structure of work	7
2. Executive summary	8
3. Role and situation of Pellet in the European Union	11
4. Renewable Energy in Hungary	15
4.1 Evolution	15
4.2 Potentials	20
4.3 Legislation	21
5. Actors on the pellet market in Hungary	24
5.1 Pellet production in Hungary	25
5.2 Pellet consumers' experiences	30
5.3 Pellet stove manufacturing in Hungary	37
6. Business Environment	39
6.1 Residential Sector	40
6.2 Municipalities and SMEs	42
6.3 Subsidies for establishing pellet production facilities	45
6.4 Subsidies for Agriculture	48
7. Agripellet	50
7.1 Raw material	52
7.2 Content and heating value	53
7.3 Agripellet vs. wood pellet	54
8. Pellet market building in Hungary	56
8.1 Areas of intervention	57
9. Conclusion	62
Acknowledgements	65
References	66
Appendix	69

List of tables

Table 4.3.1.: Electricity feed-in tariffs from 1st January 2009	23
Table 6.1.: Investment subsidies by sources for renewable energy supply and consumption in Hungary, in the period of 2007-2015	40
Table 6.1.1.: Conditions of subsidies under the National Energy Saving Program in 2009	41
Table 6.1.2.: Maximum subsidy for reconstruction of block houses built by industrialized technology	42
Table 6.2.2.: Maximum ratio of the KEOP investment subsidies in the different regions in Hungary by target groups	44
Table 7.1.1.: Potential amount of by-products from agriculture for energetic purpose	53
Table 7.2.1.: Content and heating values of different pellets	54
Table 7.3.1.: Main indicators of wood pellets and agripellets	55

List of figures

Figure 3.1.: European pellet consumption, production and import	12
Figure 3.2.: Wood sources vs. wood industry and energetic use	13
Figure 3.3.: Prices of different energy sources in Germany, 2002-2009	14
Figure 3.4.: Total installed domestic pellet boilers in Germany and relative growth of sales, 1999-2008	15
Figure 4.1.1.: Indicative targets to 2010 for the share of renewables in gross electricity consumption	16
Figure 4.1.2.: The total electricity production from renewables in Hungary in the % of the total inland consumption 2003-2007	17
Figure 4.1.3.: Renewable energy in TPES by origin in Hungary, 2007	19
Figure 4.1.4.: Renewable energy in TPES by origin in Hungary, 2020 (%)	19
Figure 4.1.5.: Renewable energy in TPES in Hungary by origin 1990-2007	20
Figure 4.2.1.: Estimated RES potentials in Hungary	21
Figure 5.1.1.: Map of Hungarian pellet production capacities, 2008/2009 (t/a)	25
Figure 5.1.2.: Surplus product from the wood industry in the form of shavings, chips and sawdust in Hungary, by county, 2004-2007	26
Figure 5.1.3.: Typical pellet packaging and delivery types in Hungary	28
Figure 5.1.4.: Pellet delivery distances in Hungary	29
Figure 5.1.5.: Share of different consumers of the Hungarian pellet production, 2008	30
Figure 5.2.1.: Reasons why consumers choose pellet based heating system in Hungary	32
Figure 5.2.2.: Replaced technology by source	32
Figure 5.2.3.: Evaluation of pellet heating systems by consumers	34
Figure 5.2.4.: purchase of pellet by source	35
Figure 5.2.5.: Distances of purchasing pellet	35
Figure 5.2.6.: Length of pellet storage period	36
Figure 6.1.1.: Available financial sources from the residential National Energy Saving Program for renewable energy investments in Hungary, 2000-2007	41
Figure 6.2.1.: Maximum ratio of regional subsidies	43
Figure 9.1.: Main barriers of pellet market development in Hungary in 2009	64

Acronyms

AEBIOM:	European Biomass Association
Austrian ÖNORM:	Österreichisches Normungsinstitut
CEN:	Comité Européen de Normalisation
CHP:	Combined Heat and Power
DEPV:	Deutsche Energie Pellet Verband
EFSOS:	European Forest Sector Outlook Study
EHA:	Fund for Energy Efficiency Loan (Hungary)/ Energiahatékonysági Hitel Alap
EMVA:	European Agricultural Fund for Rural Development/ Európai Mezőgazdasági és Vidékfejlesztési Alap
ESCO:	Energy Service Company
EWC:	European Waste Catalogue
FAO:	Food and Agriculture Organisation
German DIN:	Deutsches Institut für Normung
GOP:	Economic Development Operative Program (Hungarian)/ Gazdaságfejlesztési Operatív Program
KEOP:	Environment and Energy Operational Programme (Hungary)/ Környezet és Energetika Operatív Program
KVVM:	Ministry of Environment and Water (Hungary)/Környezetvédelmi és Vízügyi Minisztérium
LCA:	Life Cycle Assessment
NEP:	National Energy Saving Programme (Hungary)/ Nemzeti Energiatakarékossági Program
ROP:	Regional Operational Programme (Hungary)/ Regionális Operatív Program
SME:	Small and Medium Sized Enterprise
Swedish SS:	Swedish Standard
TPES:	Total Primary Energy Supply

1. Introduction

1.1 MOTIVATION

According to our experience, there is extremely limited information available on the utilization of the Hungarian renewable energy, not just abroad but also domestically.

In most cases, there isn't any comprehensive market analysis elaborated even for the decision makers, which makes it significantly more difficult to create strategic papers for the various public policies. The consumers are in this regard, perhaps even in a worse situation.

I have experienced personally at several renewable energy forums organised for small- and medium sized enterprises that there is a great demand for information on one hand and the lack of this information on the other. The situation is the same on the side of wide public. So there is increasing openness among wider layers of society to find new alternatives in Hungary, especially to decrease the unprecedented dependence on the natural gas, but very few people know the potential directions. Regarding pellet, it is often expressed that it could be one of the best alternative to natural gas from the renewable energy technologies, mainly in the retail sector, but also for the public institutions and small and medium-sized enterprises as well.

It might not be wise to stick a tag on it, but it is a fact, that in Hungary finding the alternative of the natural gas is an important viewpoint.

Part of my work is consultancy and information distribution, but regarding the usage of pellet I have missed myself quite a lot of information. In order to cope with it, and to be able to prepare an analysis, for which there is no example in Hungary, has largely motivated my job.

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1.2 OBJECTIVE

My main goal during the work has been to give a comprehensive picture of the actors of the pellet market, covering all possible areas, to look at the present situation, its specialities and the inherent possibilities.

My core questions were that, who and with what capacity move this market, what kind of strategy can be imagined for the development of the pellet market in short-, medium- and long term, and last in which fields it needs any intervention for this.

In addition, special attention was paid to the importance of agripellet that is not yet widespread at the European market, but it could help the further development of a new fuel for which the Hungarian innovations play a significant role.

1.3 CITATION OF MAIN LITERATURE

I have found great help for my work in different, especially international literature, manuals, introducing the situation of the European pellet market.

There have been other similar works to introduce the pellet market of individual countries, which could not serve as a basis for studying the domestic situation, but they provided ideas to shape the structure and methodology.

My work has been also supported by domestic literature written by prominent experts specifically made for the purpose to present the pellet production and combustion.

1.4 STRUCTURE OF WORK

It is inconceivable to prepare a proper market analysis without a useful database. Given that in Hungary there is no statistical data on the pellet production and use, as well as the production and circulation of pellet combustion equipment, therefore, I had to initiate the collection on my own merits. So a large part of the work itself has been data collection.

However, this has to be preceded by tracing the possible sources of data, so the data collection phase took quite a lot of time.

For any future assessment of data and the situation of the sector itself it is important to make the assessment with regard to the relevant policies and plans of the European Union and the Hungarian Government on renewable energy and to locate the pellet sector accordingly in the palette of the European and Hungarian energy policy.

The analysis could have been ready relatively quickly already in the possession of the suitable data, but it impeded the work longer, that most data collecting was only possible in a questionnaire survey from the market players. So part of the work was to tailor different questionnaires for different target groups, and to create adequate databases for the different types of answers.

Primarily, we have also looked at what kind of financial incentives and supports are accessible in today's Hungary from the investors' point of view working in the pellet sector. Following the afore-listed activities, an analysis was elaborated based on the collected data and to complete this work conclusions were drawn.

2. Executive summary

The pellet industry is in its initial phase of the development in Hungary, facing a number of challenges.

Most of these challenges, however, are also great potentials, if exploited in an appropriate way it could lead to a market leader position on international level.

The today's fairly small market, could grow greatly in certain segments. The sudden large-scale growth, however, may also end up in a reverse process, if it does not happen in a regulated manner. Regulation does not mean some kind of excessive, top-down intervention, but market players themselves should care about the consistency of growth of certain actors for the sake of long-term development of the industry.

Thus avoiding excessive market amplitudes followed by big declines. Obviously, it would not help for the whole industry, if only certain segments take off to develop because it would upset the delicate balance of the demand and the supply. Apparently, the introduction of the incentives aimed to increase the sales of pellet boilers will have an effect on the pellet producers through the growing demand for the product. If they won't be able to react on time, it can cause a steep price rising, with the consumers' disappointment.

Considering any markets, investors are looking for the stable, countable environment, last but not least, financing can be found more difficult without this.

According to the results of the surveys, the Hungarian pellet market actors can be characterized as follows.

Pellet producers

Hungarian pellet producers are producing mainly wood pellet, on the basis of wastes and by-product from wood industry. The vast majority of pellet production capacity is located in the Western region, due to the higher number of forests, and the denser occurrence of wood waste. 10-20 pellet production companies are currently really active nowadays in Hungary. The participating 10 companies in our survey cover in vast extent the domestic capacities. These are typically small in size, the number of employed persons range between 5 and 20.

The produced product consists of 50% pure wood pellet, 30% agripellet, and the remaining 20% is produced in a mixture of the two.

They mainly rely on local sources, raw materials are transformed from a distance of 50 kilometers.

The capacity compared to the 2008-production of about 4 thousand tons is forecasted to reach 105-110 kt in 2009.

The end product is offered in bag packing characteristically (15-20 kg, or 500-1500 kg ones) for the consumers, which mainly means heating systems of family houses.

Pellet consumers

The choice of pellet heating technology by serious users is mainly decided based on environment protection and lower operating costs compared to fossil energy.

An encouraging result is that the majority of pellet consumers replaced their gas combustion with pellet combustion, that reinforce the view that the pellet represents a realistic alternative of natural gas.

The majority of users use the pellet in central heating systems, but the number of different fireplace users is increasing, because of its lower price.

The general opinion of consumers is that the domestic pellet supply and purchase option is very limited and scarce. The latter is supported by the fact that the majority of users have to go 30 km distance to obtain pellet.

A common experience of the users is that they are quite satisfied with the systems in operation and economical aspects of the pellet heating.

The majority of consumers are aware of the quality characteristics of the pellets, and know the requirements of the pellet heating system.

Pellet stove manufacturers

In Hungary, we have found 6 major pellet stove manufacturers, four of which participated in our questionnaire survey.

The pellet stove manufacturers employ more people even though there are fewer than pellet producers, obviously due to the specifics of technology and production.

According to the results of our survey the employed staff numbers take shape around 100-120 and some 2,000-2,500 boilers are manufactured annually, from which almost 30% are exported.

Actually, they are almost totally Hungarian-owned firms, and practically 100% of their production is coming from own innovation. In order to increase the competitiveness, mainly the control electronics should be developed and sophisticated.

In the future, thanks to the growing demand for pellets, and the result of decreasing raw material quantity, the interest will definitely grow for **agripellet** made from plants from agriculture (main product, by-product, wastes) both in the domestic and European markets. In this respect, major Hungarian firms have serious chances to reach international leading role both with products and raw material development.

The whole Hungarian pellet sector can be effectively promoted by **grassroots development**, and the industry-led initiatives. The actors in this sector should be developed in the following areas in a detailed strategy:

- **Public awareness raising**
- **Hungarian standard for agripellet**
- **State supports and incentives**
- **Innovation** (pelletising technology, agripellet stoves, plantation)
- **Education**

Part of these will not be elaborated with the collaborance of the sectorial actors, but it would be wise to provide assistance concerning proposals for the decision makers.

3. Role and situation of Pellet in the European Union

The demand for the pellet rose suddenly within a few years in some member states of the European Union, significantly in Austria, Germany and Sweden. Meanwhile in these countries, a reliable background industry took shape, through which they became important exporters of technology both in the field of pellet stoves and pelletising equipments.

In the three listed countries the market can be considered as the most developed concerning the regulations, as the national standard systems were drawn up, which are normatives throughout Europe. On the reason of this the unified EU standard concerning solid biomass fuels born in 2005, incorporated the standards of the three mentioned national standards in a large extent. The categorisation of the combustibles and his characterisation delivered up in CEN 2005/TS 14961 standard implies it.

The experience shows that in those countries, where there is not a national standard in effect, generally the Swedish SS, the German DIN, or the Austrian ÖNORM standards are regarded as reference. This is true for those countries where the majority of pellet is produced for export. It is the same in Hungary, but it is only adequate for domestic markets at first sight. We could be right to suppose that since most of the Hungarian producers produce for export, therefore they must comply with foreign standards, it will help for the domestic market when taking off, only high-quality pellets will be sold. Given that this issue will also be more discussed later, it's only at the outset that the relevant national standards are generally tailored to local opportunities.

The strict quality requirements had been tailored to the relatively large amount of Swedish, German and Austrian high-quality wood-based waste pellet production. In Hungary, this quality is only available in a very limited quantity, but there are great opportunities for the exploitation of the agricultural plants. The pellets produced from this, however, will certainly not meet the requirements set out for wood pellets. Therefore, the creation of a national standard would be needed for the agripellets. This could later be the basis for a single standard for use in the EU in relation to agripellets.

The demand for pellets in Western Europe is growing to such an extent that it is becoming less and less able to meet its own resources. The following chart (figure 3.1.) shows that pellet consumption in Europe year by year and during six years, from 2000 until 2006 it grew nearly ten-fold increase, while its production is less and less able to keep up with the growing demand.

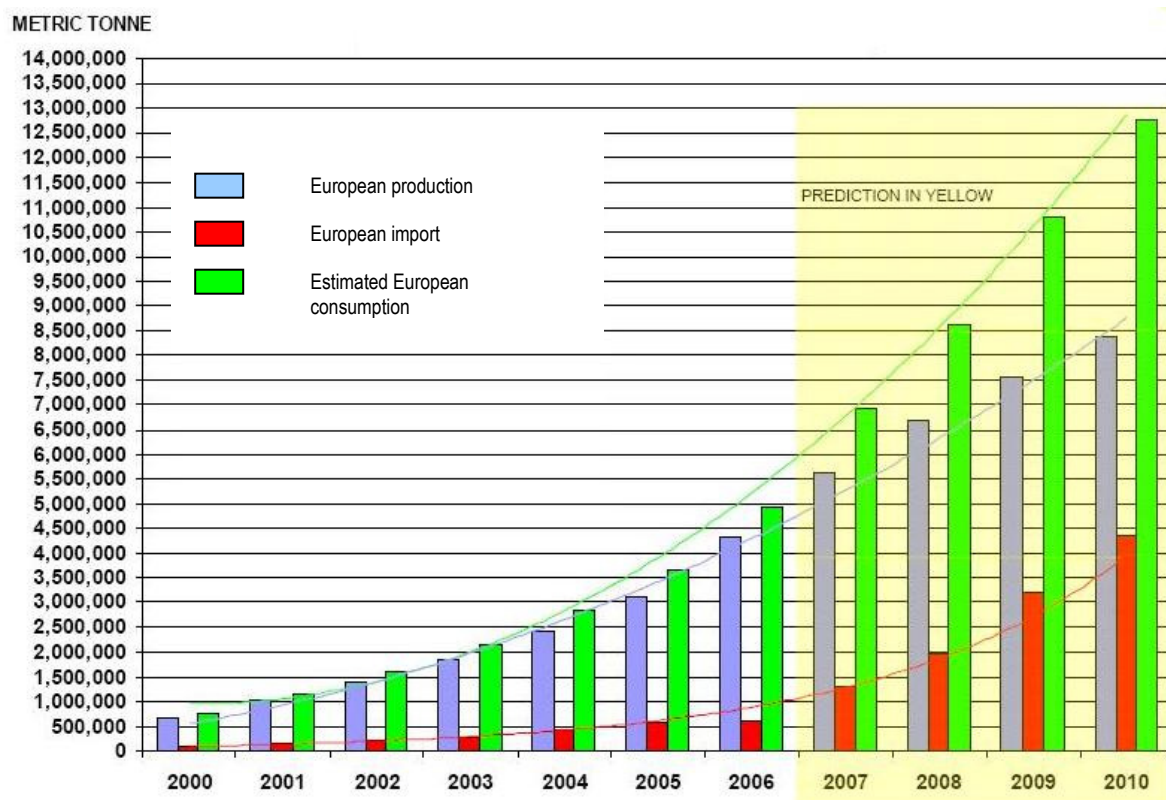


Figure 3.1.: European pellet consumption, production and import
 (Source: Staffan Melin and Hungarian Pellet Association)

Beside the continuous increase of the consumption it is obvious that the production will stay behind the increasing need in future according to the forecasts, which can be helped by the drastic increase of the import to substitute.

The question appears, where is the limit of this growth? Most analysts now unanimously state that there is no more reserves from the timber, therefore, in addition to the import the usage of other raw materials should be started. This could mean a wide range of waste, but in reality only the agricultural plants grown in large quantities could balance the market for a certain period of time.

Agripellet – as raw material - will also be discussed latter, but only at the outset that the introduction of this material requires serious development since the combustion technology differs from the wood pellet. In addition, certain types of agricultural plants are sought by other segments of the renewable energy sector, such as biogas, and biofuels sectors.

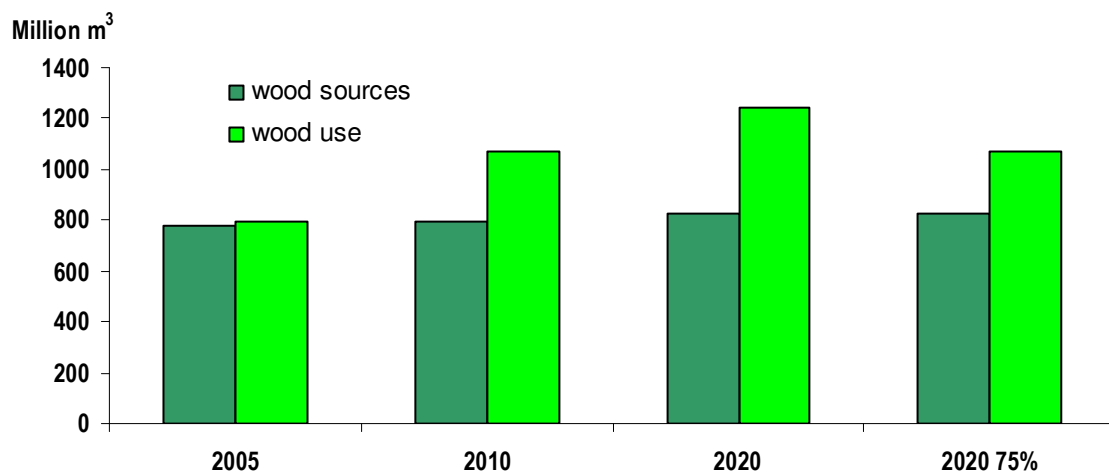


Figure 3.2.: Wood sources vs. wood industry and energetic use
(source: K. Prins, UNECE/FAO Timber Section, Nov. 2007)

The figure above shows the difference between available wood resources and projected demand of energetic use is 16 times higher in 2010 than in 2005, and 26 times higher in 2020.

The numbers are coming from the EFSOS (European Forest Sector Outlook Study) projections and policy objectives.

The „75% scenario” for 2020

In this scenario the relative share of wood to other renewable sources decreases by 25% in 2020 compared to 2005, unless the absolute value of wood for energy generation would then be below 2010. In this scenario the wood demand to fulfil the renewable energy targets is reduced (compared to the baseline scenario) in all those countries that have a high increase in renewable energy in absolute figures. This is the case, if:

- a) countries have a strong increase in their scenario for TPES (like Spain), or
- b) a strong increase in percentage of renewables (and a slowly increasing, or decreasing TPES).

Source: Wood Resources Availability and Demands, UNECE, FAO, University Hamburg – 19 October 2007

The unbroken growth of the pellet market can be limited however not only by the scarcity of the natural potentials. The unregulated free market processes, the excessive state support, can cause similar drastic changes, as it was the case in Western Europe in winter of 2006-2007. The growing public support for the deployment of pellet boilers, and the market price of pellet, being lower compared to other fuels as a result, resulted at the start of an early

heating season, a suddenly emerged demand for pellets boilers. In this way, of course, it also increased the demand for cheap pellets, which led to the emergence of a strong market demand. As a result, however, the price of pellets increased dramatically, leading to increased customer dissatisfaction and diminished demand, both in the form of pellets, and the pellet boilers.

The following diagram (figure 3.3.) shows the evolution of the market price of pellets in Germany, where in January 2007 the price of pellets had reached the price of heating oil, and then due to fell of the great demand was followed with a drastic reduction.

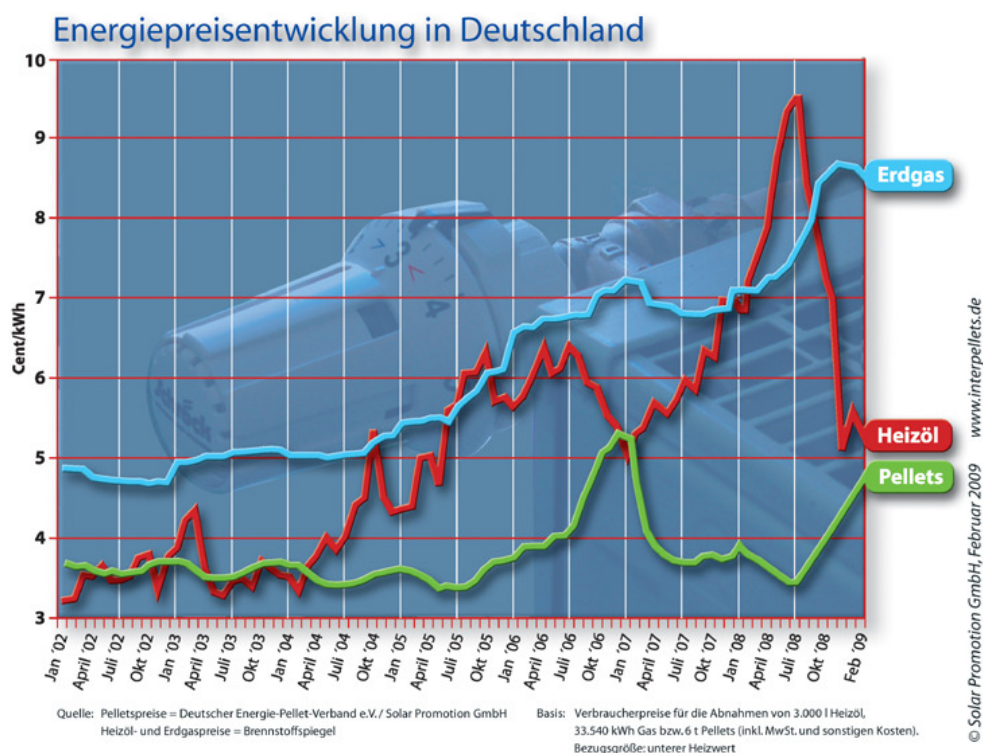


Figure 3.3.: Prices of different energy sources in Germany, 2002-2009
(Source: DEPV and Pellets Magazin, 2009)

By these days the increase in demand lead to once again into a similar situation, which is caused much more by the movement of oil prices and the political debate about the oil and gas trade between Russia and Ukraine.

The above example shows that if the players are not in conformity to keep a balanced market growth, and their motivation is lead by short-term interests, which is stressed by an otherwise goodwill state support, the market will act in a hectic way, so the consumers finally will lose confidence.

The process described above is reflected in the sales of pellet boilers, as well (figure 3.4.). The German data show that, although the number of sales in absolute terms is higher year by year compared to the previous year sales growth rate, however, varies greatly.

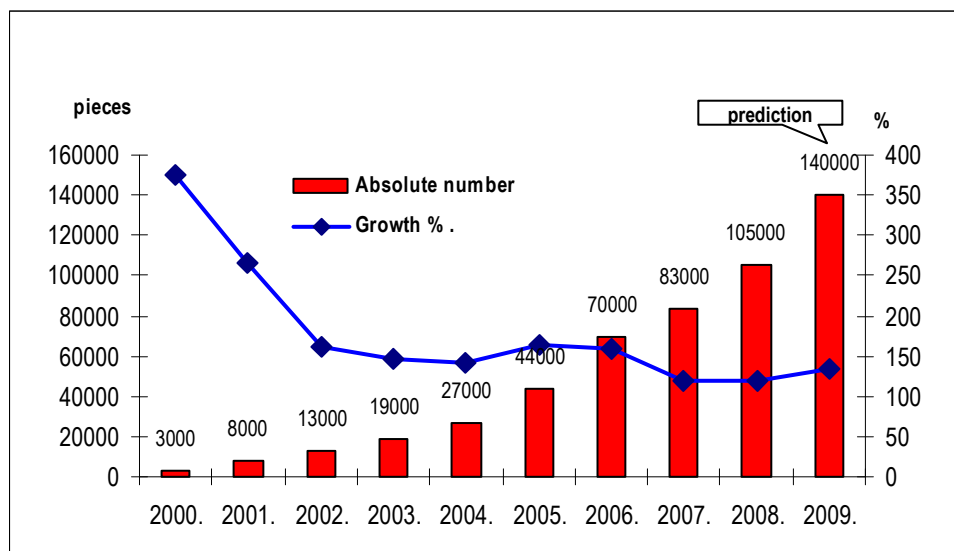


Figure 3.4.: Total installed domestic pellet boilers in Germany and relative growth of sales, 1999-2008
(Data source: DEPV and AEBIOM, 2009)

4. Renewable Energy in Hungary

In order to identify the present and the possible future role of pellet one needs to examine the present structure of the Hungarian way of using renewable energy resources, the tendency of development in the past and what can be expected in the future.

4.1 Evolution

In spite of the fact, that trial projects had been started in the 1970s, in the area of using solar energy and biomass, and in the 1980s industrial and agricultural geothermal energy was used mainly in the Southern region of the Great Plain, the real break-through can only be mentioned from the mid-1990s. Though, this break-through was quite modest compared to European standards.

For decades, the main obstacle of this development has been the lack of the current political elite's commitment in the direction of exploiting renewables. Even before the change of the political system – during the last period of planned economy – Hungarian experts elaborated a strategy to reduce the country's dependency on imports on the basis of biomass.

The realization of this was made impossible by the politicians in power who committed to build up the economy based on the imported gas from the Soviet Union. The results of that can be felt even today. Gas plays a dominant role in the energy supply of the households, the public institutions, industry and in smaller scale but in the power stations. The actual price of gas became political, or if you like, electoral tool, by the state support of the consumer price. This created a fairly deformed market, in which the renewable energy sources start with a disadvantage, as when applying the latter technologies, both the consumers, and the decision-makers expect them to stand fast on the market without any state subvention.

The slowness of the process is clearly shown by the fact, that even in 1993 the Hungarian Parliament had adopted a decision on the energy politics, in which it had been stressed out that increasing the ratio of the renewable energy sources had been highly needed, a real action plan was only born in 2008.

In general, the Hungarian politics of renewable energy can be considered a “following-type”, especially since the joining to the EU in 2004. This means, that beyond the EU expectations, that has been kept on a minimal level, none of the governments in power has been able to undertake any ambitious action based on the domestic possibilities.

Due to that, Hungary is the last in the row (see the figure 4.1.1.) with directive relating to the goals for 2010 with the 2001/77/EC which is about making it compulsory to increase the ratio of renewable energy within the utilization of electric power.

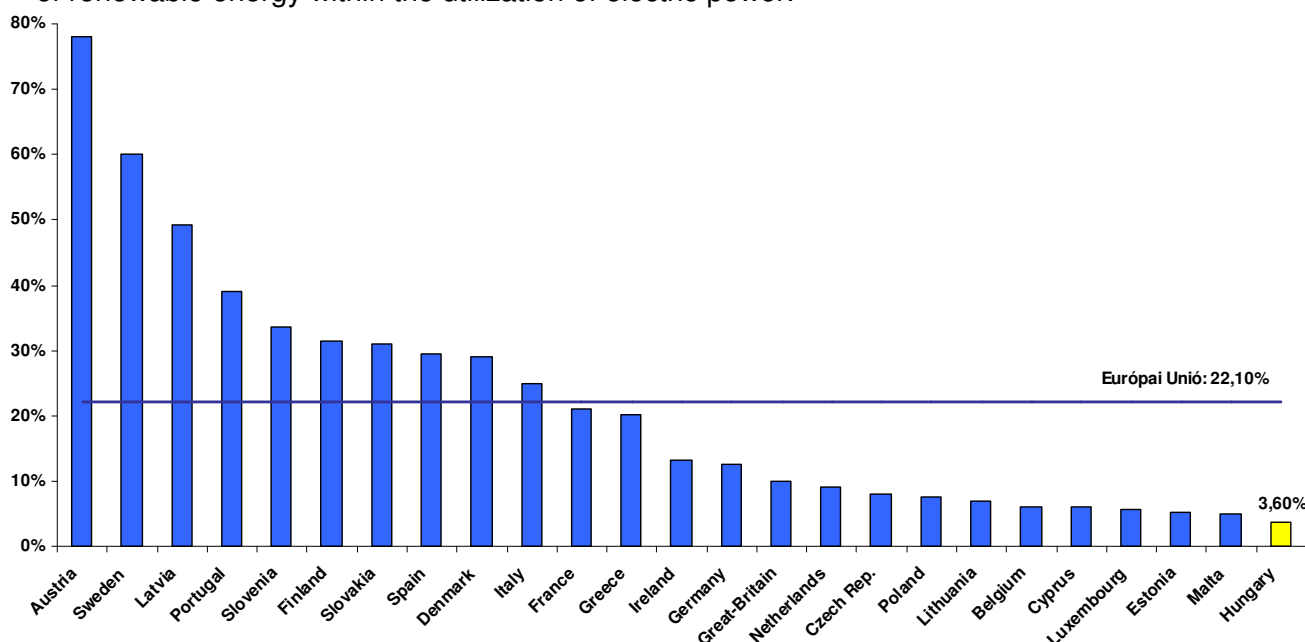


Figure 4.1.1.: Indicative targets to 2010 for the share of renewables in gross electricity consumption
(Data source: Europe's Energy Portal/Statistics)

Thanks to the low undertaking, in 2005 Hungary had not only fulfilled but even already overfulfilled its goals for 2010 (see figures). Unfortunately, behind the fulfillment, there is a fairly low efficient production structure. More than 70% of renewable energy based electric power production comes from low efficient power stations burning woodchip that has replaced the low efficient coal of 26-27% productivity (KVVM – 2008). Moreover, some of them do co-firing with coal and biomass, what can not be described as clean renewable energy technology.

The low efficiency derives from the fact, that most of the power stations are not able to use the arising heat energy, so they do not work in CHP system. Also, they are not so much motivated to change this, while the feed-in tariff of green electricity provides acceptable returns for the investments.

Due to the aforesaid situation, at present, almost the whole obtainable domestic woodchip market is contracted. Any further growth is only possible by increasing the efficiency and/or establishing farms for energy plants. This last information bears high importance for the players of the shaping pellet market.

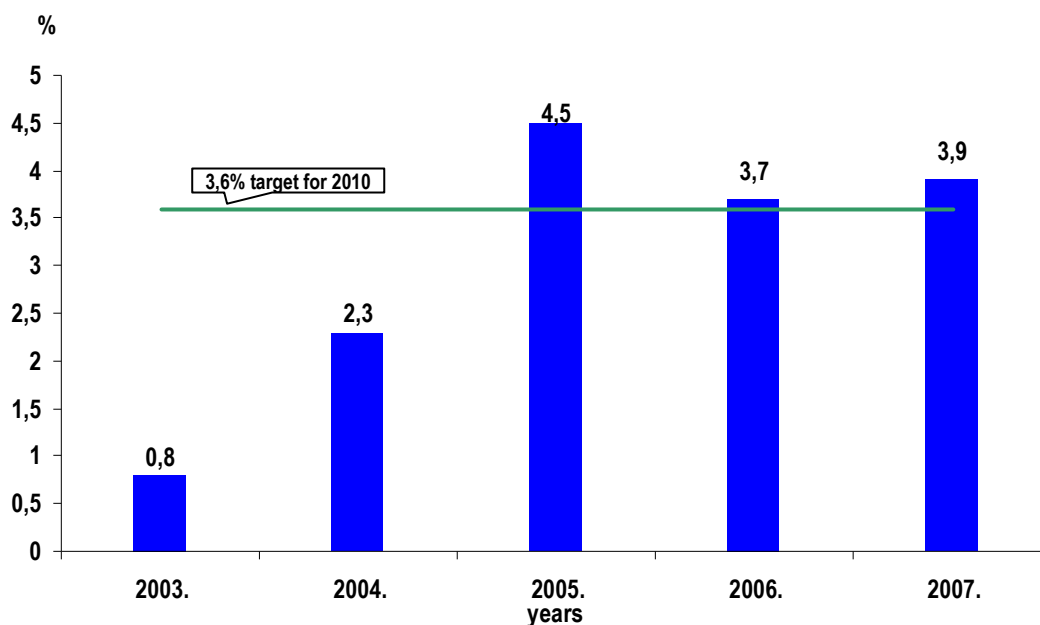
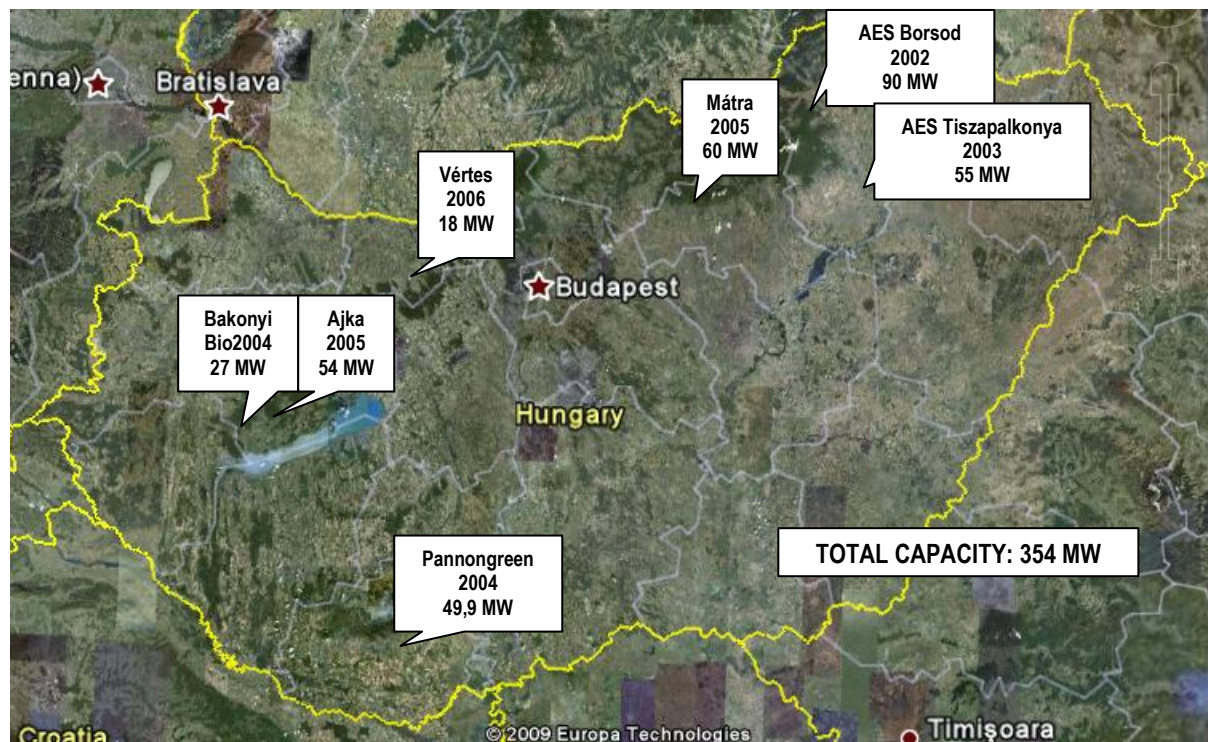


Figure 4.1.2.: The total electricity production from renewables in Hungary in the % of the total inland consumption 2003-2007
(Data source: MVM - Hungarian Electricity Works)

The map below shows those power stations that have partially replaced their coal combustion with solid biomass burning, also the starting year of biomass factory, and the capacity of the installed electricity producing device.



Within the whole primer energy consumption, which was 1120 PJ in 2007, 52.9 PJ derived from renewable energy, which equals 4.7% ratio. With regard to that, since 2009 Hungary has undertaken to reach a goal of 13 % by 2020 as a member of the European Union.

The present composition of renewable energy sources and the forecasted share by the year of 2020 is presented in the tables below.

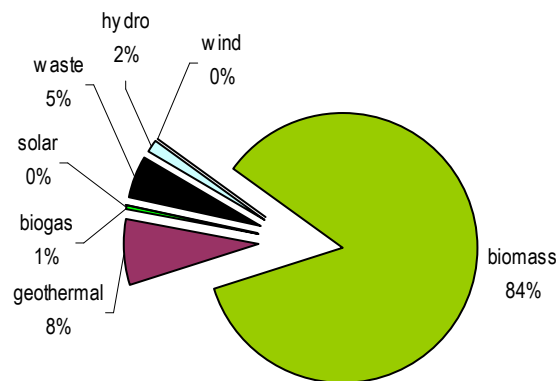


Figure 4.1.3.: Renewable energy in TPES by origin in Hungary, 2007
(data source: Energy Centre Npc.)

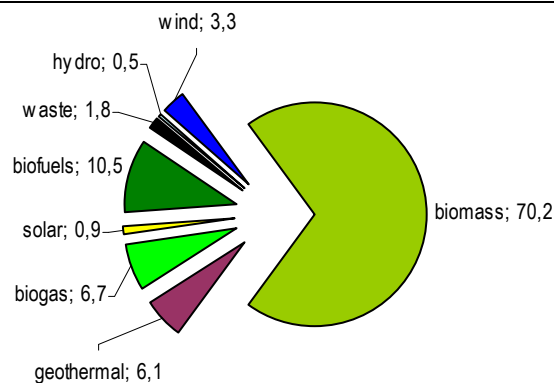


Figure 4.1.4.: Renewable energy in TPES by origin in Hungary, 2020
(%)
(data source: Ministry of Transport, Telecommunication and Energy)

The figures (4.1.3. and 4.1.4.) related to 2020 come from the central Renewable Energy Strategy accepted by the government in 2008.

The above tables clearly show for both periods that the biggest portion comes from biomass. This basically means solid biomass that includes woodchip, and other forestry or agricultural waste burning, co-firing as well.

According to the Strategy the biggest growth can be expected from the wind energy, the biogas, and the biofuel, meanwhile the geothermal and water practically stagnate and even later on the solar energy bears a marginal part.

The next figure (figure 4.1.5.) shows how these proportions have changed in the last few years. Here, the dominant part is again presented by the solid biomass, while other technologies slowly appear in the renewable portfolio.

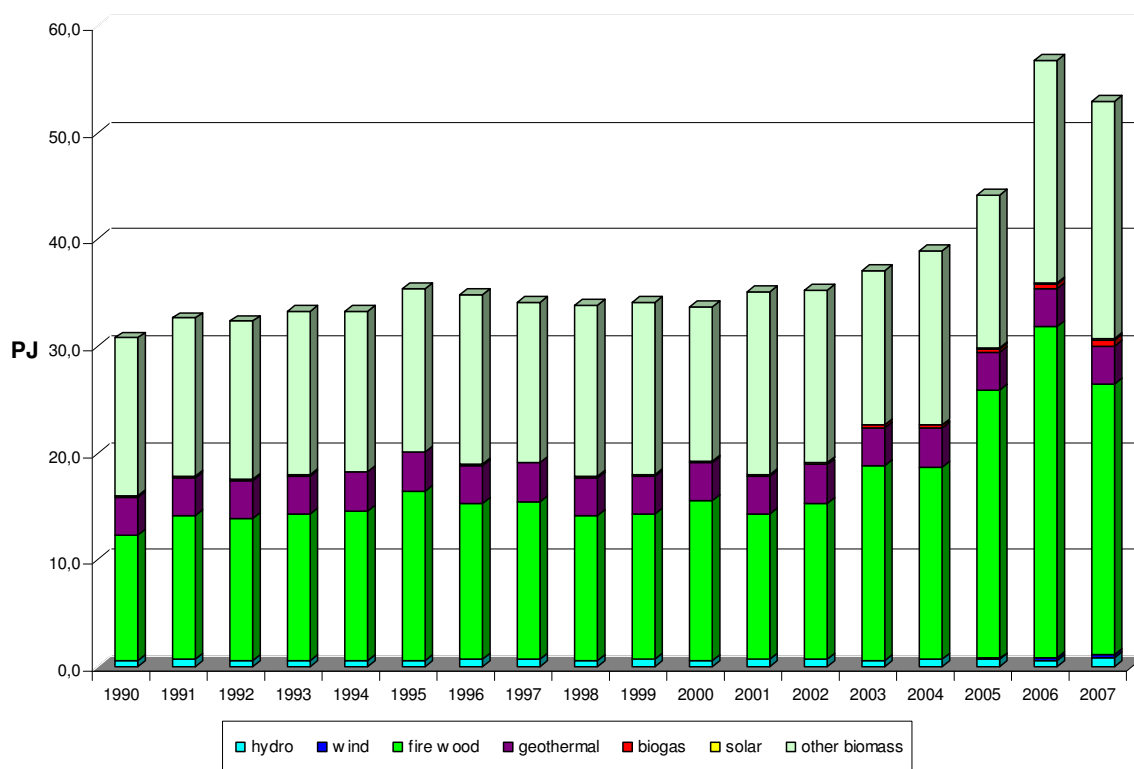


Figure 4.1.5.: Renewable energy in TPES in Hungary by origin 1990-2007
(data source: Energy Centre Npc.)

4.2 Potentials

There are several calculations for describing the potentials of renewable energy sources in Hungary in the past decade. Most of them are theoretical ones, giving an overall picture, but this is not enough to make strategic and business decisions. Calculations for the technical potentials are more useful from this aspect, but the economical calculations are still missing in Hungary. This is one reason why politicians have been hesitating to create a clear long-term strategy. They should try to find the best way among the different interests of the industrial lobby.

The figure below gives information on the available calculations on the technical potentials of different renewable energy sources in Hungary. The different columns are representing the different institutes that have made calculations. It shows that the solar energy has the biggest potential, while surprisingly wind energy is on the second place, since Hungary has only on-shore possibilities. The last column shows the total primary energy supply in Hungary in 2007.

By looking at the above figures, one could say that Hungary could easily cover its whole energy need by using renewable energy sources. This way the above figures can be misleading, even though they already present the technologically available potentials still the economically available amounts are missing. Moreover, the situation can be very different by

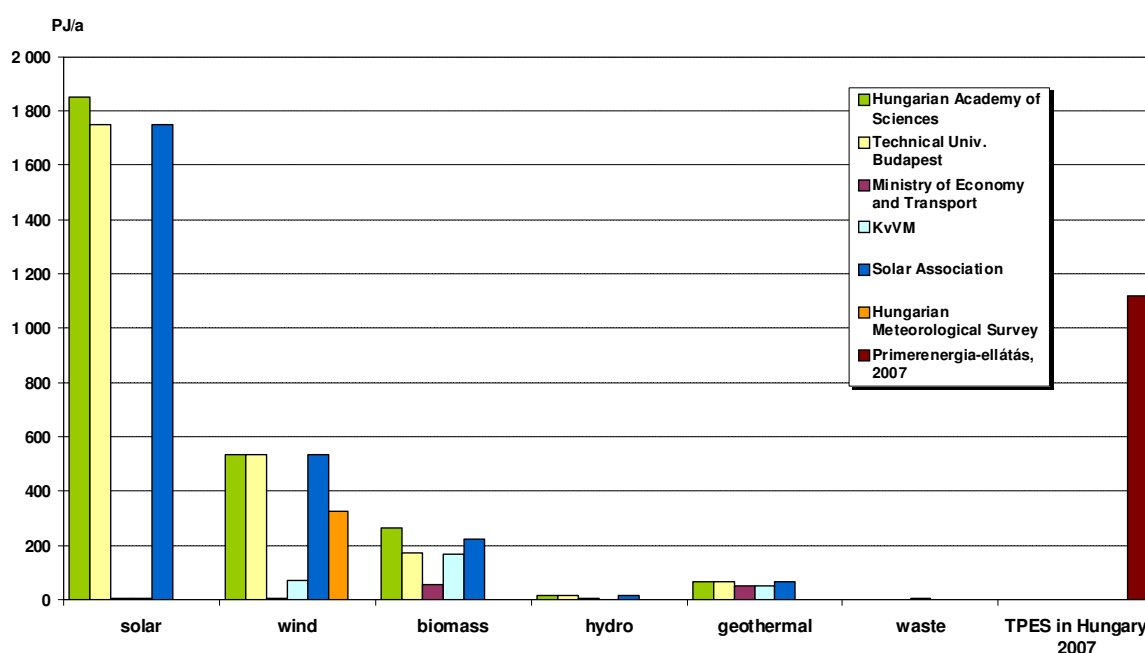


Figure 4.2.1.: Estimated RES potentials in Hungary
(source: Energia Klub)

regions, which is important why the smaller area gives the more different picture regarding the local available potentials or sources. The portfolio of renewable energy is different in each region depending on the local natural, social and economic fundamentals.

The above figure is still very useful to shade off the picture regarding the dominance of biomass in Hungary, and to draw the attention of the decision-makers to the unexploited and considerable possibilities of the solar and wind energy.

4.3 Legislation

In Hungary, electricity production with the exploitation of renewable energy sources is regulated by Act 2007. LXXXVI. (former 2001. CX) *on electricity* (hereafter referred to as the Electricity Act). The Electricity Act coming into force in 2001 and amended significantly several times since, contains the regulation concerning the feed-in obligation of green power. According to this rule, the public utility electricity provider is obliged to take over the electricity generated from renewable energy sources at a higher price than the market price. The

difference between market price and obligatory acceptance price is financed from separate reserves of income fee within the system use fee. This item is built in the costs of each and every consumer and system user. This system is reorganized since from July 2007 regarding to the market liberalization.

The existing system is based upon fixed-priced obligatory takeover; however, since 2005, following significant modifications, the system has been rather mixed. Since September 2005 the Electricity Act differentiates between weather-dependent (sun, wind) and weather-independent (biomass, water, geothermal) renewable energy sources. The same acceptance price is paid at all times for the energy generated by means of the former ones, whilst for the latter, there is a difference between the acceptance prices depending on the peak and off-peak periods of the total consumption. This rule is modified in 2007, so in the latest version of the Electricity Act (2007. LXXXVI.) the weather dependent and independent definitions and distinction doesn't included but the rate of difference between the level of feed in tariff is still the same in case of these renewable energy sources (table 4.3.1.).

Feed-in tariffs have been determined in the Electricity Act in 2005 with the one condition that its value may increase at the rate of annual inflation. Previously the acceptance price had been legislated in ministry orders.

Simultaneously, a special situation arose in 2005 in terms of wind power since the upper limit of national capacity was imposed at 330 MW. The capacity in 2009 reached 129 MW but permission was requested for an additional 1,138 MW. With reference to the stability of the electricity system, from the spring of 2006 no permit may be obtained for wind power stations generating electricity for the grid. This situation is not expected to change until 2010.

Current feed-in tariffs, available from the 1st of January 2009 are shown on the table below.

Title			Peak	Valley	Deep valley
Produced from renewable energy sources	Based on resolution of Hungarian Energy Office (HEO) if it was adopted or the application was received before 01. 01. 2008. [except hydro power station units (PSU) >5 MW]	Solar, Wind	9.38	9.38	9.38
		Other than Solar and Wind	10.47	9.38	3.83
	Based on resolution of HEO ⁶ adopted after 01. 01. 2008. (except hydro PSU >5 MW, other PSU > 50 MW)	Solar	9.29	9.29	9.29
		Produced by PSU of 20 MW or less (except Solar)	10.38	9.29	3.8
		Produced by PSU of >20 MW – max. 50 MW (except Wind from 30th Nov. 2008, Solar)	8.3	7.43	3.03
		Produced by Wind PSU of >20 MW – max. 50 MW from 30th Nov. 2008	10.38	9.29	3.8
		Produced by PSU comprising used equipment	6.45	4.13	4.13
	Produced by hydro PSU > 5 MW, other PSU >50 MW		6.45	4.13	4.13

Table 4.3.1.: Electricity feed-in tariffs from 1st January 2009
(without VAT), €cents/kWh (rate: 300 HUF/EUR)
(Data source: Hungarian Energy Office)

Beyond the electricity feed-in tariff there is no further incentives to promote the utilisation of renewable energy sources.

In connection with renewable energy, there are incentives for the citizens, local governments, and business enterprises. Most of these, with the exception of the citizens', derive from the EU, which will be discussed later in chapter 6.

In order to reach the goal of 186 PJ re. renewable energy having been targeted by the Government for 2020 would need 2,300 billion HUF (~7,6 billion EUR) calculated by the Ministry of Transport, Telecommunication and Energy (~7,6 billion EUR). The need for support connected to this, makes roughly 400-420 billion HUF, half of which have already been covered by the running incentive programs at present. Further amounts are planned to be sourced by the new EU sources starting to be paid from 2013.

5. Actors on the pellet market in Hungary

We may not talk about a mature pellet market in Hungary at all. The germs of this only appeared last year. Thanks to that, there isn't any official statistics available. Market information can only be obtained from companies operating exclusively in the market, but these are of course mostly sales information. Access is limited to the latter, depends on the attitude of the company that may or may not publish it.

Without market data it is very difficult to draw any kind of conclusion on the Hungarian pellet market situation.

This situation encouraged us to initiate our own survey to be able to write this thesis. We have invited three types of pellet market actors to participate in the survey and data collection. These were pellet consumers, pellet producers and pellet stove manufacturers and dealers. For the different market actors we have prepared separate questionnaires (see appendix). Luckily the Hungarian Pellet Association was just founded in 2008 so the survey was done in cooperation with them. The Hungarian Pellet Association has quite large overview already about the evolution and current state of the domestic market through its members, so additionally the survey provided lots of useful experience that could help our work.

The success of the survey was highly influenced by the willingness for answering of the participants. In general, it can be said that the users have been the most cooperative, while the pellet and boiler manufacturers, as well as the distributors responded on a rather low number of questions. This might be because in such an un mature market the level of distrust is quite high regarding this type of work, even if it is done through an advocacy umbrella organisation. The Hungarian Pellet Association has not had enough time to demonstrate the usefulness of its activities and its effectiveness since its foundation. Therefore, some of the current market actors, who are still able to run a profitable business through their exports, are waiting, and they try to find their customers by their own efforts, instead of actively participating in the common market developments.

Naturally the three types of market actors, the consumers, the pellet producers and pellet stove manufacturers and dealers depend on each other to a large extent, neither can exist without the other in long-term. Below, there is a brief overview of the available data on the basis of the current situation of each pellet market actor.

5.1 Pellet production in Hungary

There is only estimated data available on the Hungarian pellet production and its consumption. According to an EU project that has collected data, the domestic pellet production capacity is at present around **10-12 thousand t/a** (pelletsatlas), while the domestic utilization makes **4-5 thousand t/a** (pelletsatlas).

During our research, 25 companies were found in Hungary that produces pellet. Among these 17 only deals with pellet production, the additional 8 firms also sell or produces pellet boilers. The afore mentioned 25 firms can be identified on the internet but only 18 out of these gives contact information, so we could only reach them with our questionnaire. Unfortunately only 10 firms approved to provide answers and data so this way it only makes 55%. According to the Hungarian Pellet Association this ratio fairly covers the domestic pellet producers' market, considering that beyond this circle there must be only a few firms dealing with production. But more investments are about to start their business, so it can be expected that the production capacity will grow with a higher speed, higher than our survey can show based on data provided by the participating companies at present.

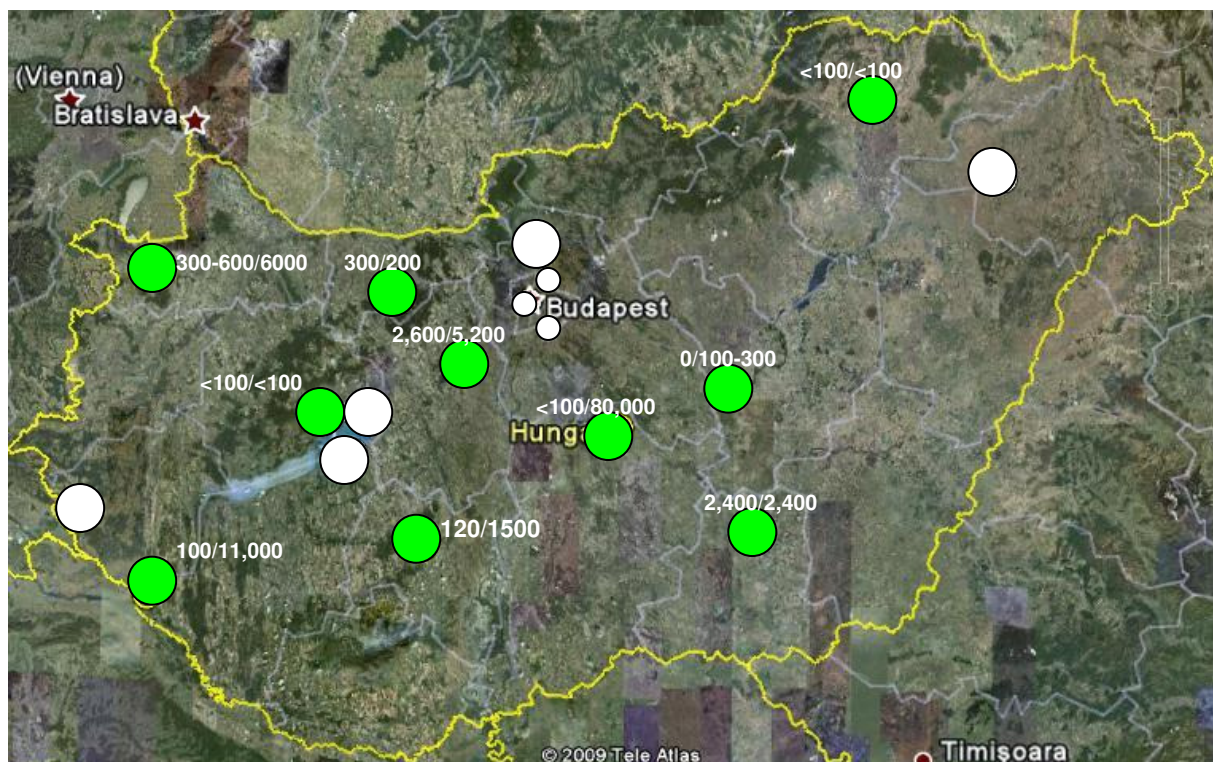


Figure 5.1.1.: Map of Hungarian pellet production capacities, 2008/2009 (t/a)
(Data source: own survey, 2009)

The map above shows the pellet manufacturers regional location. The green colour means those firms that have provided answers to the survey, while the white ones have not, (figure

5.1.1.) but based on available market information we believe they do deal with pellet production.

By looking at the map, it can be seen that most of the pellet manufacturers are located in the Western part of the country. This is obviously connected to the raw material sources. Most of the wood factories are also located in this region, as the configurations of the terrain and the climatic influences prove better condition for afforestation (figure 5.1.1.). In opposition the manufactures operating in the Eastern part of the country mainly utilize the great amount of agricultural waste, so they focus on agripellet production.

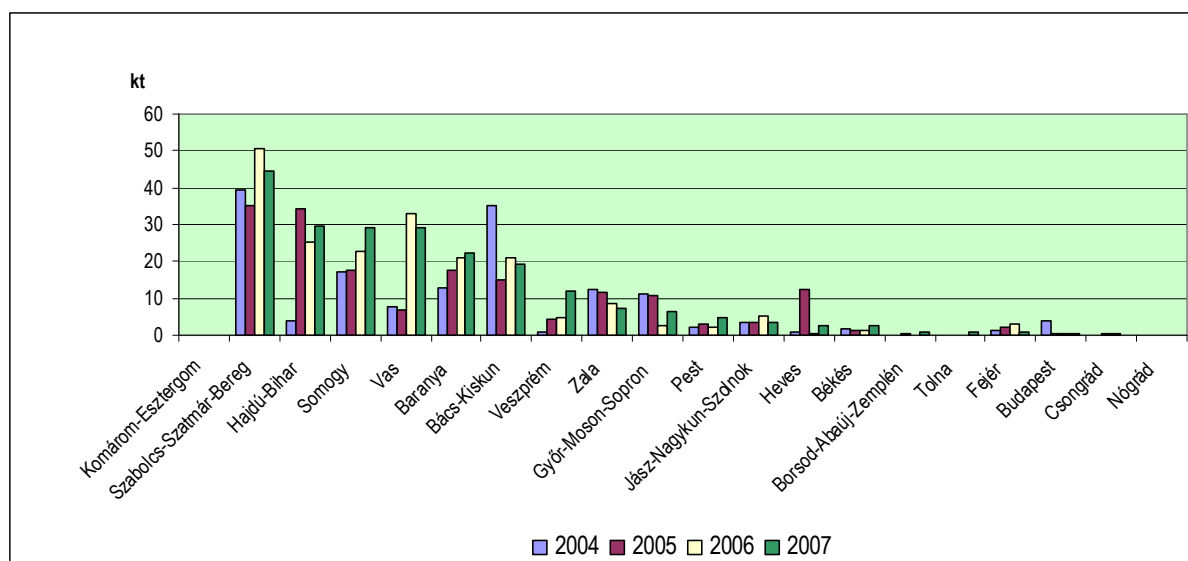


Figure 5.1.2.: Surplus product from the wood industry in the form of shavings, chips and sawdust in Hungary, by county, 2004-2007
(Data source: Ministry of Environment and Water)

The above figure gives a summary (figure 5.1.2.) of the registered amount of clean wood chips, shaving, and sawdust based on the EWC code, that can be used by the pellet manufacturing by county. With the exception of two counties that can be found in the East (Szabolcs-Szatmár-Bereg and Hajdú-Bihar) most of them are located in the Western part of the country. Obviously, the indicated amounts are informational only, using them can depend on different conditions. It is not all the same, how the amounts cumulated by counties are divided, from how many places they are collected, how soiled they are by other waste etc.

It is worth to consider what have been said by some of the pellet manufacturers, which is, the great amount of wood waste is for nothing if the wood firms are not willing to handle them separately and they are mixed with other waste found on the plant of the factory. These can be dust, nails, screws etc. so the raw material needs costly pre-handling. At first the latter could seem as something to overcome easily, but during the personal interviews many

complained that even after several requests no careful attention is paid to the separation of waste, though in most cases it would only require not to put the swept dust from the floor into the wood waste.

Results from the survey

The below data covers the activities of the firms participating in the survey, not providing the complete market capacity, but come from important market players of today's Hungarian pellet production.

SIZE OF COMPANIES

A common characteristic of the participating firms is the small size when talking about the employment rate. The ten companies employ 80-90 people altogether. 60% of the companies employ 5, or less, but the remaining 40% also employ not more than 5-22 people. This only means the full time employees, excluding the part time or seasonal work force.

PRODUCT AND RAW MATERIAL

Half of the companies, produces wood pellet, 30% agripellet and the remaining 20% both products. Most of the questioned companies get their necessary raw material from the wood industry, and five out of ten indicated the agricultural waste, as well as the energy crop plantations as source of raw material. The energy plantations are the raw materials of four out of the ten businesses in a certain percentage, though there is only in for which it means over 50% in quantity. **This clearly proves, that the Hungarian pellet manufacturing mainly uses forestry, wood or agricultural byproducts as raw material at present.** The purchase of raw material never happens further than 100 km, 70 % do it within 50 km distance.

60 % of the questioned producers claimed to have some kind of quality certificate of their products, or at least they are in conformity with some kind of standards. In most cases, this means the German DIN, or the Austrian ÖNORM standard.

PRODUCTION, CAPACITY

Looking at the production figures of 2008, in most cases the value is around 100 tons/year and even the highest capacity does not exceed 2500 tons/year. The planned capacities for 2009 by the same circle shows a completely different picture, with a wide range compared to

the previous year. **According to the cumulative figures the total production will be seventeen times higher in 2009 than in 2008, being around 105-110 kt. In 2008 the production was nearly 4000 tons.**

Studying the export figures, it doesn't seem as high as it was projected by us among the interviewed participants. It means higher than 50 % at four out of the ten, and in only two cases exceeds 90%. It is worth to note, that in four cases they do not have any export activities. The latter ones are mainly agripellet producers, not having a significant market even abroad yet.

LOGISTICS

It is typical at the Hungarian market, to transfer or to have transferred the pellet by the customer oneself. More serious companies arrange transform regularly themselves, yet there are boiler producers who only give guarantee for their boilers if it is used with the pellet also delivered by them, in exchange caring about regular delivery. The latter does not represent the majority, it was only mentioned as an example.

The most popular package is the one weighting 15-50 kg (figure 5.1.3.), but the 500-1500 kg „big bag” is also sold in a large quantity.

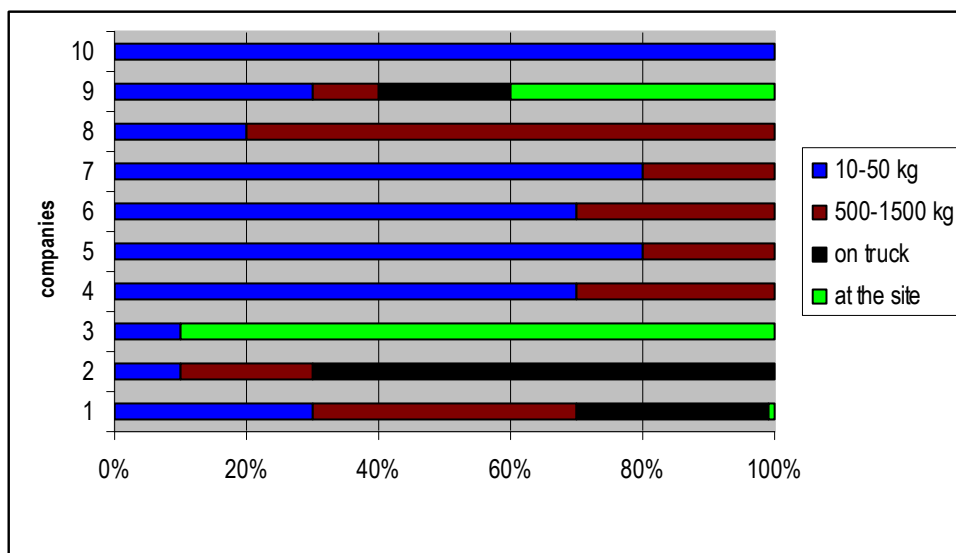


Figure 5.1.3.: Typical pellet packaging and delivery types in Hungary
(Data source: own survey, 2009)

During our survey, we were also interested in what distance the produced pellet is delivered and sold. Earlier it was mentioned that the necessary raw material for pellet production is mainly obtained within 50 km. Pellet is sold mainly within 0-200 km distances. (figure 5.1.4.). We have found many producers, who sell 100 % of their products in such distances. With the increase of individual distances, the ratio of the number of producers and the produced

quantity decreases. This also stresses, though does not prove, that the domestic producers do not produce for export. It has been clear already before by looking at the export ratios.

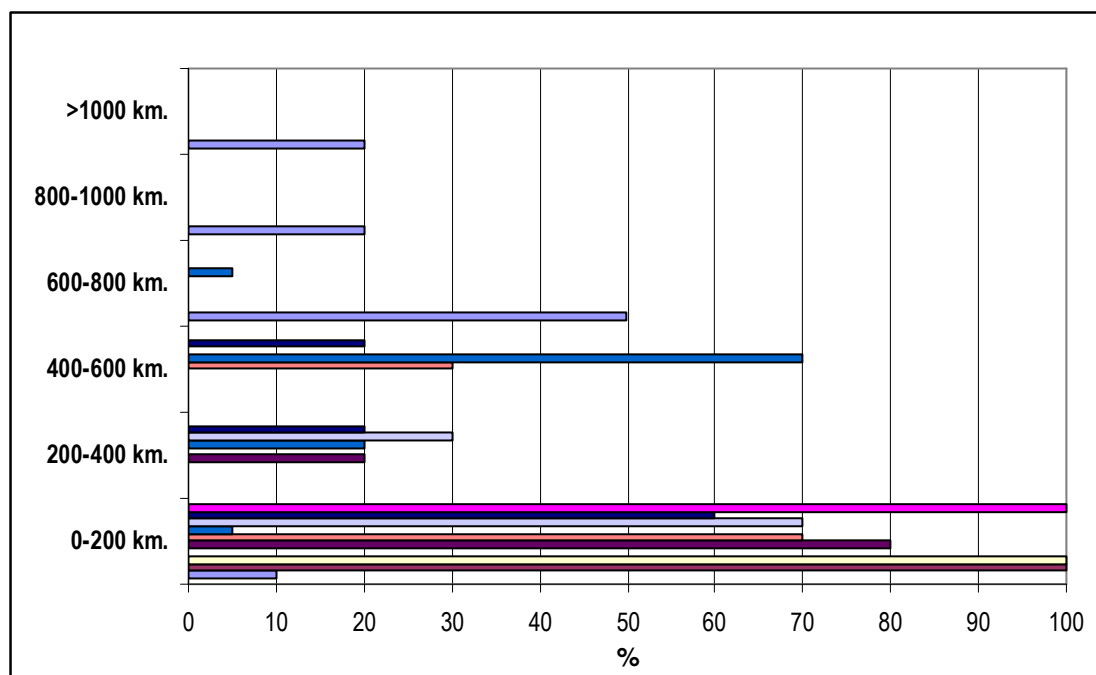


Figure 5.1.4.: Pellet delivery distances in Hungary
(Data source: own survey, 2009)

CUSTOMERS OF PRODUCERS

Following the analysis of the customers, we have noted that **the highest ratio was made by the family house heatings** in 2008 (figure 5.1.5.). These customers used 36% of the produced pellet quantity, and each pellet producer sold/delivered to this customer group. As it can be seen in the figure, quite large proportion of pellet purchased by intermediate dealers. 70% of pellet producers have mostly sold 20-50% of their pellet production to pellet dealers. Only one company who sold nearly 100% (95%) of its production to pellet dealers. It is worth to mention that 10% of total, purchased by district heating companies is coming only from two pellet producers. In spite of that, the consumption of public institutions representing almost the same proportion (8%) from the total, are supplied by four companies. This is the same at the industrial sites.

The category “other” has signed by only two companies. In these cases the own institutions of the pellet producers give that amount of consumption.

It is visible that the consumption of power plants was very low in the group of these producers. This is not a surprise in case of pellet, because in the size of power plants, wood chip could be the most economical solid biomass fuel.

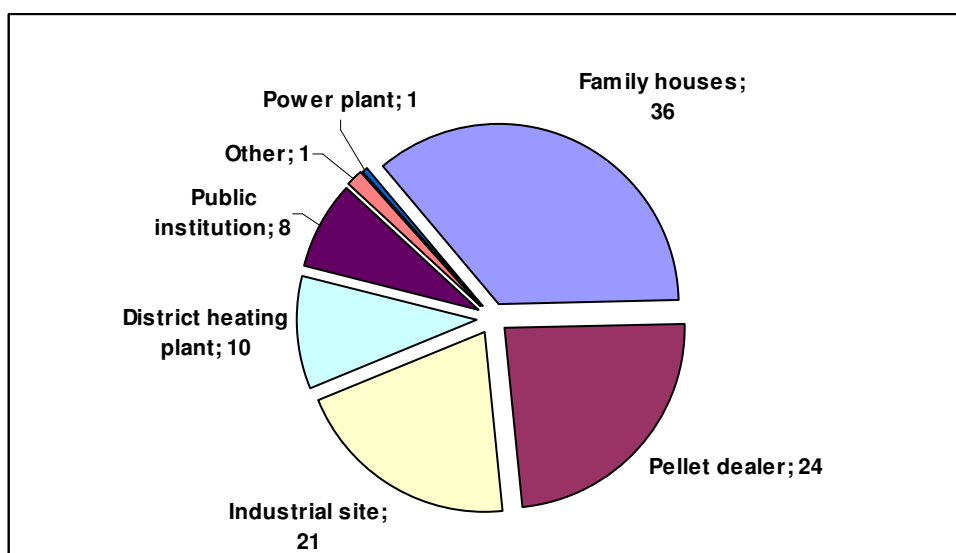


Figure 5.1.5.: Share of different consumers of the Hungarian pellet production, 2008
(Data source: own survey, 2009)

5.2 Pellet consumers' experiences

Basic information of pellet consuming and consumers are even less available than pellet producers. It is given because official statistics also don't exist, and naturally it is much harder to find the customers and consumers on the internet and in the literature than pellet producers. The only and relatively precise data source could be the data base of the pellet producer and dealer companies, but the acces to this data is almost impossible as it is treated as internal information.

In the reason of that, we have made some extra research on the websites of the companies checking their data and their references, and we have gathered information on a chat forum for pellet users before we started our survey. The participants of the survey are coming from this and we could invite 13 large and 15 household consumers. However, the rate of the answers among large users is only 23%, while among households this reached 87%.

According to our calculation, users who gave answers are utilizing about 232 tons/a of pellet, which represents 7-8% of the total inland sales turnover (2,900-3,000 tons/a) of the pellet producer companies.

In spite of this low representing rate, quite much useful data and information was given by the household consumers, wich is characterizing the market situation well.

General and surprising experience was that, how the most of household pellet users feel themselves vulnerable against pellet prices and need information and advice inconnection with the sources of supply. The latter is on the other hand more critical, because it could mean that customers don't get sufficient information about pellet sources when they buy the pellet boilers.

Some of the customers responded that also, in today's Hungarian market, some of the dealers retain the stock of pellet waiting for the best price of the season. So, it is really hard to find cheap pellet fuel out of the season.

According to some opinions, pellet prices are set to the all-time natural gas prices keeping it 20-30% lower than that, which is a causeless and artificial high pricing for pellets.

Let's see the results of the survey in more detail:

Summerized data of the participants of the survey:

Total amount of utilized pellet:	232 t/season
Household consumers (13):	42,2 t/season
Large consumers (3):	190 t/season

Installed capacity:	1,312.2 kW
Household consumers (13):	202.2 kW
Large consumers (3):	1,110.0 kW

Surprisingly quiet much, 75% of consumers answered that they choosed the pellet boiler as a central heater because it is a "green" technology, when we asked the reason of their choice (figure 5.2.1.). The lower operational cost than other technologies as a reason is also behind that. This is even surprising because according to the other results of the survey, 62% of the participants could easily choose other technology and 38% had no other choice than pellet.

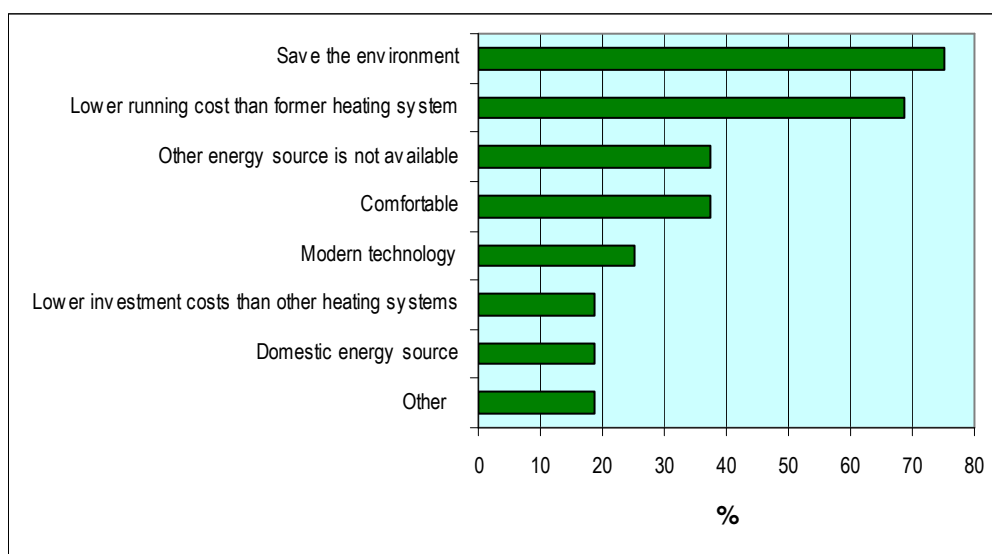


Figure 5.2.1.: Reasons why consumers choose pellet based heating system in Hungary
(Data source: own survey, 2009)

The big competitor of pellet is natural gas which was replaced at 53+7% of consumers. (figure 5.2.2.). Good news that the second most often replaced heating source was electric power which is one of the most pollutant (because of the Hungarian electricity-mix) in Hungary. 13% of consumers choosed pellet firing technology as the first in their new building and 13% was also who replaced a low efficient, other biomass based, log wood firing.

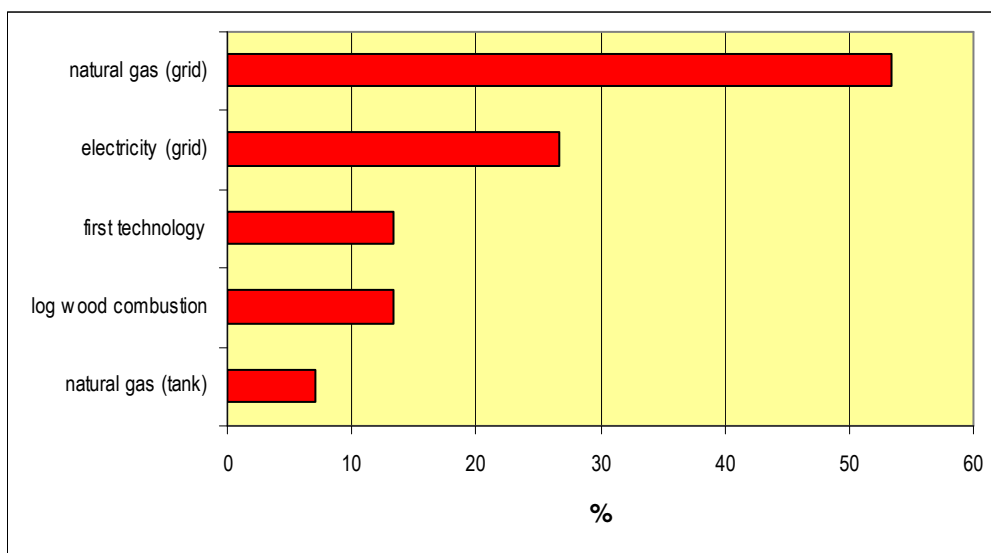


Figure 5.2.2.: Replaced technology by source
(Data source: own survey, 2009)

In the following we provide information in more detail on household consumers only.

PURPOSE OF CONSUMPTION AND TYPE OF SYSTEM

Pellet firing is supplying the total heat demand at most of the consumers (70%). On the other hand the heat demand of hot water consumption is supplied at only 40% of consumers is supplied by pellet firing. In these cases in summer time other additional heat source help to produce the heat of the total hot water demand. We can find electricity, natural gas, log wood and solar energy sources as a mixture among additional sources. None of them is dominant, the ratio is more or less the same of them.

To see the type of the different systems we can find central heating systems at 70% of the consumers and 30% uses different pellet stand alone systems like fireplaces etc.

The capacity of the systems among the central heating ones is between 8 and 35 kW, while the installed capacity of the fireplaces is between 6 and 12 kW.

Most of the pellet systems (85%) has automatic controlled feeding system.

The age of the systems is very young. The average years of operation is 2,3 heating season per system, where the oldest has been working for 6 years only, but the majority (70%) of them is not over the second heating season.

The average pellet consumption per household is in the heating seasons is 3,2 tons/season. This amount is differentiated by the capacity of boilers, or stoves and the purpose of consumption, of course. The consumed tons of pellets deviated between 1.5 and 8 tons/season.

EXPERIENCES OF CONSUMERS

We asked the consumers in our survey to evaluate their own pellet heating system, according to the operational experiences so far, in the aspects of “reliability”, “comfort”, and “fuel availability”. We gave three statements for each of these categories, from which the respondent had to choose the most typical.

Owners were clearly satisfied with the operation of their pellet heating systems, cause the major of them stated that these are quite reliable. Only a few of them mentioned some system failures, but nobody complained about unsatisfactory experiences (figure 5.2.3.).

Regarding conformt the situation was the same in all cases, as nobody claimed to have had any tasks besides the general or the advised maintenance of the systems. This can mean that the customers of such systems are well aware of the pellet combustion, and also that they get satisfactory information at the purchase by the producers or traders.

The situation is different in regard of raw material supply. It reflects that the market is still in its initial phase, therefore it is either very difficult to obtain pellet or there is usually one source for buying nearby commented the majority of customers. (figure 5.2.3.). Due to that the consumers find it quite unreliable.

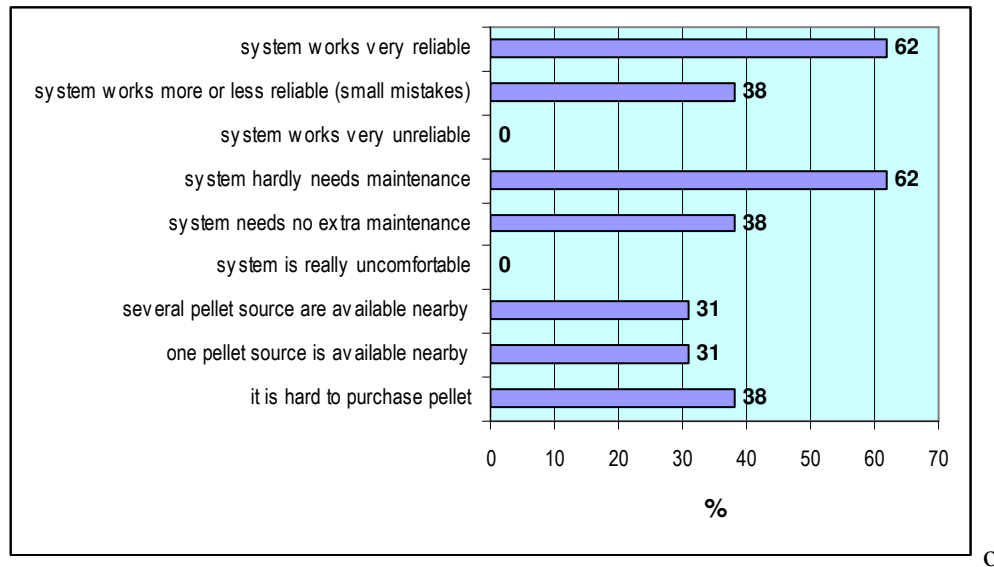


Figure 5.2.3.: Evaluation of pellet heating systems by consumers
(Data source: own survey, 2009)

LOGISTICS

Customers of pellet were questioned what size of packs they usually buy the necessary quantity and from what distance. 90% of the interviewed have some kind of storage place. It varies, whether it is a building specially created for such purpose, or a room having converted from another type of storage place, but only in one case was the pellet stored right next to the boiler.

Half of the consumers have the pellet delivered, and the other half arranges the purchase and the delivery themselves at the trader or at the factory. There was no case when the customer had contracted with the transporter or trader, who ensures the necessary quantity on a set price.

Consumers are mainly contacting pellet traders (figure 5.2.4.) and only 23% purchases directly from the manufacturer or from the plant. Very few of them buy by surfing on the internet for the best offer.

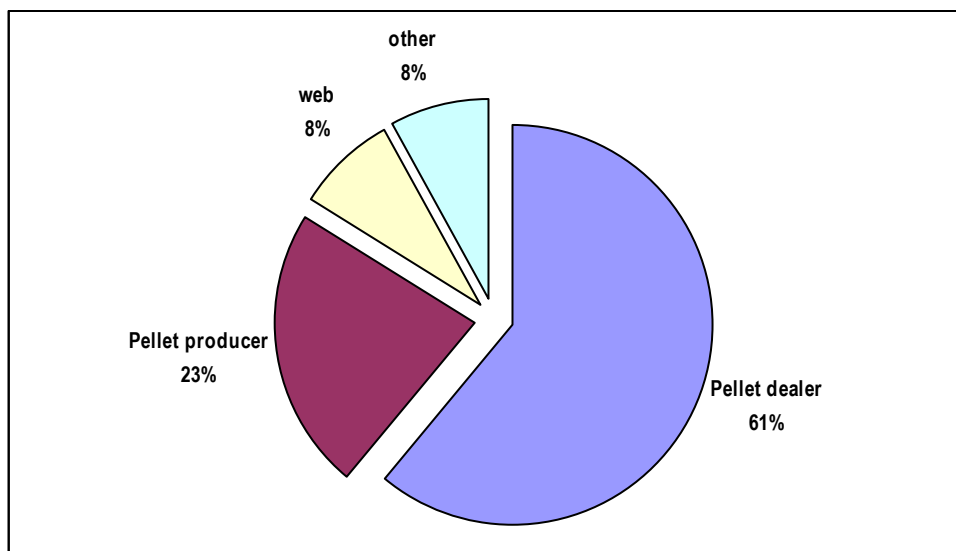


Figure 5.2.4.: purchase of pellet by source
(Data source: own survey, 2009)

32% of the customer makes the purchase of pellet within a distance of 30 km, the majority from further distances (figure 5.2.5.). Out of those, 25% need to go beyond 100 km to be able to buy combustion material.

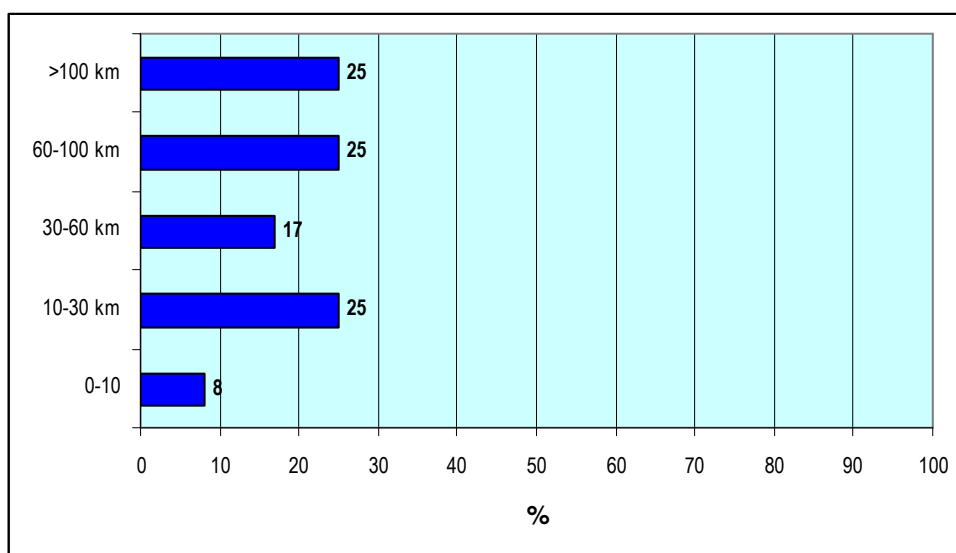


Figure 5.2.5.: Distances of purchasing pellet
(Data source: own survey, 2009)

Concerning the size of packages, we can conclude that apart from the purchased quantity at one time, everyone - only with one exception – gets the 15-20 kg packages of pellet. Later on these packages are poured into the storages by the individuals themselves. The use of trucks having modern equipments for filling bulks of pellet is not yet typical on the Hungarian

market. Also regarding the storage, generally the majority stores a quantity more than what is needed for at least half a year. (figure 5.2.6.)

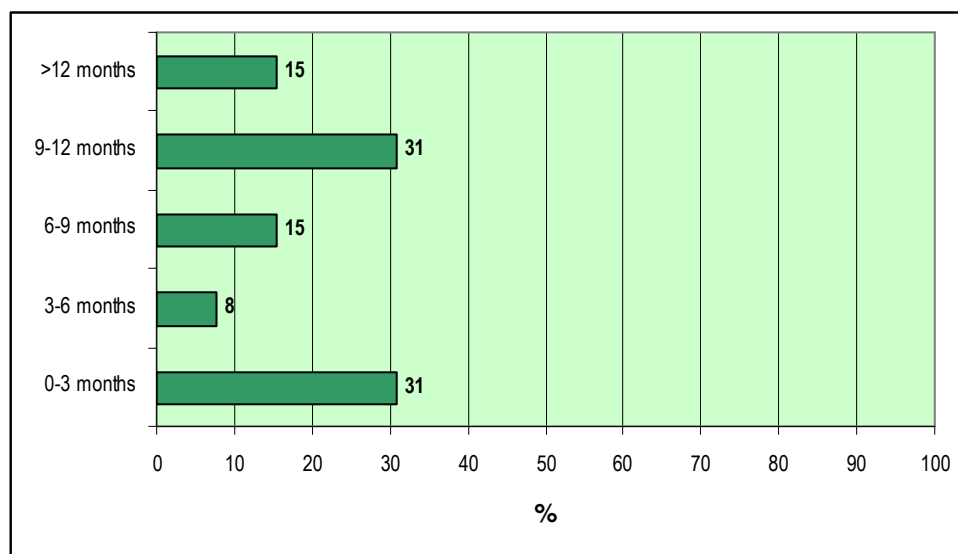


Figure 5.2.6.: Length of pellet storage period
(Data source: own survey, 2009)

QUALITY

According to our experiences, the domestic market offers quite a wide range of available pellet regarding quality showing serious differences. The bad or variable quality can disappoint the consumers which can create a generally bad attitude towards the pellet combustion technology. During our survey, we have tried to figure out to how the consumers check the quality, what their experiences are in connection with that.

The survey showed that most of the customers do pay attention to the quality and are aware of the product standards. Most of them are satisfied and know what details to check out when buying. Hereby, we can emphasize again that the consumers seemed to be well prepared, having obtained information beforehand, and also to had been well informed at the time of the purchase of boilers. They are still satisfied with the quality despite the fact that the majority (77%) had experienced differences in quality of the purchased pellet. At the time of purchase we can see in what order the below listed quality indicators are taken into consideration:

1. Heating value
2. Reliability/Consistency
3. Humidity
4. Colour
5. Packaging

The majority (70%) is satisfied with the price for value of pellet and finds the running costs acceptable.

FINANCE

Only with one exception, all the interviewed purchased their pellet combustion stoves and the instalment of the heating system from their own sources. State funding was only requested in one case, but it has not been reimbursed yet. In another case, bank loan was taken for completing the investment.

5.3 Pellet stove manufacturing in Hungary

The most difficult to get any data or market information were the representatives of the boiler manufacturers and traders out of the three segments of market actors. True that in connection with them our main goal has been to draw a map of the situation of the domestic manufacturing and since there are only a few of them we believe that the results reflect the reality.

There are only six boiler producers in the country and four of them provided answers to our questionnaires. Much to our regret, the two left out, are important actors, while they produce completely Hungarian developments of boilers for several years for both the domestic and foreign markets.

Concerning the wholesalers, unfortunately due to the very low rate of answers (3/21, 14%), the results can not be assessed.

Regarding the boiler producers the total number of employees are about 100-120. We can not give exact values for the companies indicated values instead of exact numbers in the answering sheets.

Almost 2,000-2,500 pieces of boilers were made in 2008 out of which 30% is exported and no significant change can be expected in 2009 regarding capacity. Almost each manufacturer prepares boilers for room heating and central heating systems.

One company from the four responded to have foreign interest, the rest is 100% Hungarian who produce their own designed pellet boilers.

Pellet boiler producers generally count their own developed boilers are competitive comparing to western European products. On the other hand, the dealers of boilers responded that the weak points of the Hungarian products are the automatic control system

which is not user friendly and the quality of the material. They advised more concentration is needed on innovation and development on these fields in order to increase competitiveness. Further interesting experience was that most of the pellet boilers producers have own sales activity and they don't or can't work together with the retail and/or multinational traders.

6. Business Environment

Business or investment environment analysis is closely linked to the subsidy policy of the country. This is particularly true for a "young" industry like the production and use of pellets, which will definitely need support and different forms of state incentives in the phase of building up a functioning market.

As discussed in Chapter 2, Hungary is not very generous with regard to incentives given in the field of using renewable energy sources. Currently, the "green power" is supported by the State, while the use of fossil energy sources is also supported on a number of different scores. One of them is the often criticized support the state gives reducing the price of the gas for approximately two million households, which means EUR 330 million (HUF 100 billion) from the state budget. In 2009 this amount has already been reduced, but it will still be EUR 270 million (HUF 82 billion). It must be noted that this support is originally based on the social/financial situation of a family, even if - due to the logic of the system – at the beginning it supported users with high gas consumption. In contrast, however, the state support given to residential usage of renewable energy and investments increasing power-efficiency was only EUR 14.8 million (HUF 4 billion), which is only 5% of the amount for the gas price reduction. The gas price support has always had political reasons, as nearly 80% of the Hungarian households use natural gas for heating and warm water production, which means a huge number of voters.

The existence of the gas price reducing support has to be taken into consideration by all market participants representing renewable energy aiming at private and public sectors.

In this sense pellet combustion is in a good position, as due to the price of the fuel the operational costs can be 30-40% less than for the natural gas. However, the problem is that the price of the heater can be 2-4-times higher than that of operating with natural gas.

Hereinafter the different forms of subsidy and bank services will be discussed based on the different users, but before we summarize the investment subsidies available in Hungary within the next 6 years.

	Financial Sources (million EUR)		
	National	EU	Sum
KEOP: Heat and electricity production and supply by renewable energy sources	50	143	193
KEOP: Biofuel production, middle- and large capacity	4	12,7	16,7
EHA: Energy Saving Fund	15		15
NEP: National Energy Saving Program	87		87
ROP: Regional Operative Programs	8,3	25	33,3
Subsidies by area for energy crop production		330-400	330-400
EMVA: European Agricultural Fund for Rural Development ¹	13-20	37-63	50-83
Altogether	177-184	548-644	725-828

Table 6.1.: Investment subsidies by sources for renewable energy supply and consumption in Hungary, in the period of 2007-2015
(Data source: Renewable Energy in Hungary – Status Report, Energia Klub 2008 and Ministry of Transport, Telecommunication and Energy)

6.1 Residential Sector

The residential sector, within this the individual households, can access direct investment funds since 2000. Every year the Government separates a sum from the annual state budget for the National Energy Saving Program. In this program residential use of renewable energy, energy saving and energy efficiency investments are supported. Past experience has shown that the program has been very popular, the rather small allocated sums are generally used within weeks. Given that no pre-determined sum is separated but the measure is discussed every year, the sum and the intensity of the support is changing annually. This hectic change is disadvantageous for the market because the subsidies largely determine the annual turnover of the small and medium-sized enterprises operating in this sector. Often, they can not prepare for the sudden change in the market, which is driven by the existence or non-existence and the extent of the subsidies (figure 6.1.1.).

¹ Estimated average hectare (200 thousand) and beside 165 EUR/ha subsidy

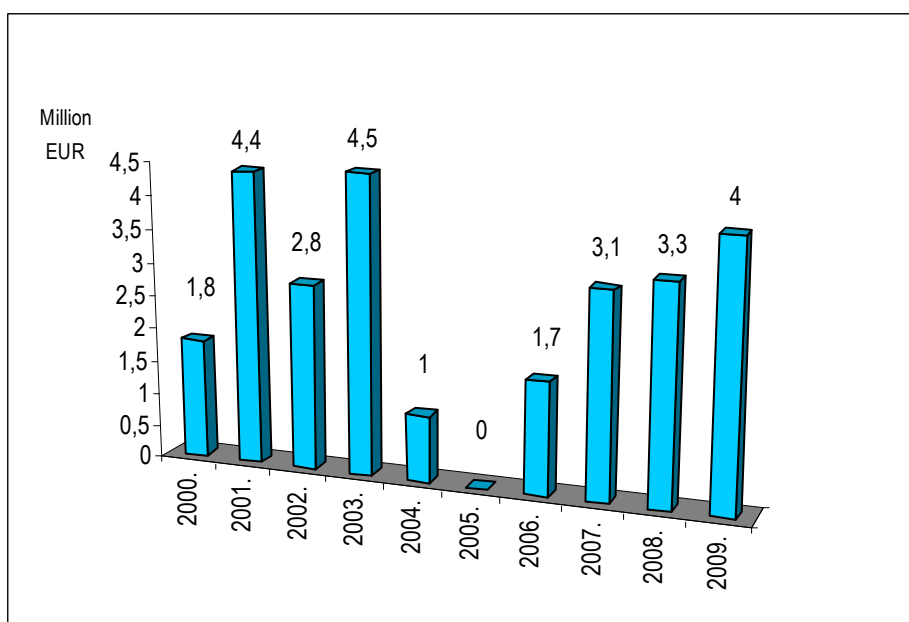


Figure 6.1.1.: Available financial sources from the residential National Energy Saving Program for renewable energy investments in Hungary, 2000-2007
(Data source: Renewable Energy in Hungary – Status Report, Energia Klub 2008 and Ministry of Transport, Telecommunication and Energy)

From 2008 the program has been extended by a reduced rate credit facility. The adequate sum has been separated for this, however, the domestic bank system has not yet accepted this facility, so the user should go through the procedure if one wishes to size this opportunity. The distribution and the intensity of the subsidies planned for 2009 can be seen in the following table (table 6.1.1.).

Area	Maximum Subsidy		Maximum Additional Loan		Maximum subsidy including additional loan
	ratio (%)	amount (th EUR)	ratio (%)	amount	
Changing or insulating unefficient doors and windows	20	1 170	80	4 690	5 860
Reconstruction the heating and warm water system	25	1 670	75	5 000	6 670
Additional wall insulation of buildings	25	1 670	75	5 000	6 670
Multi purposed efficiency investment	30	4 000	70	9 300	13 300
Renewable energy consumption	30	4 000	70	9 300	13 300

Table 6.1.1.: Conditions of subsidies under the National Energy Saving Program in 2009
(Data source: Ministry of Transport, Telecommunication and Energy)

The sum compared to that of the year 2008 has risen by approximately 20%, and the intensity of support was extended by 5%. This extend can still be criticized, but it is promising that thanks partly to the recognized goal values for the year 2020, having realized that spectacular result can be achieved in the private sector also on national level, the situation of the program seems to be stabilized. Thus, besides the increase in allocations, hopefully there will be no dramatic changes in residential subsidies.

Another support directly affecting the residents is the so called "Block of flats Program", which is also financed by Hungarian state budget. In this blocks of flats built by industrialized technology are entitled to apply for funds, in particular for energy saving and efficiency investments, but the feature of the use of renewable energy sources appears as well.

Limited amount of data is available about this form of support, but the following has been published about the plans for the second half of 2009 (table 6.1.2.)

Area	Maximum Subsidy	
	ratio (%)	Max. €/flat
Reconstruction of block houses built by industrialized technology, including renewable energy utilisation	33%	1 670

Table 6.1.2.: Maximum subsidy for reconstruction of block houses built by industrialized technology
(Data source: Ministry of Transport, Telecommunication and Energy)

6.2 Municipalities and SMEs

There are several programs financed by EU funds and national contribution to support the use of renewable energy and to increase energy efficiency of municipalities and SMEs. In this chapter we are going to focus on the sources promoting the use of renewable energy resources.

Any business investment in this field should take into account the so-called map of support, which states if the region given is viable for subsidy, and if so what is the maximum level of support intensity to be obtained there. The map of support was drawn based on the level of development of the different regions, in accordance with the commission directive 1628/2006/EC. Obviously the more developed a region is the less intensity of support can be given and vice versa (figure 6.2.1.).

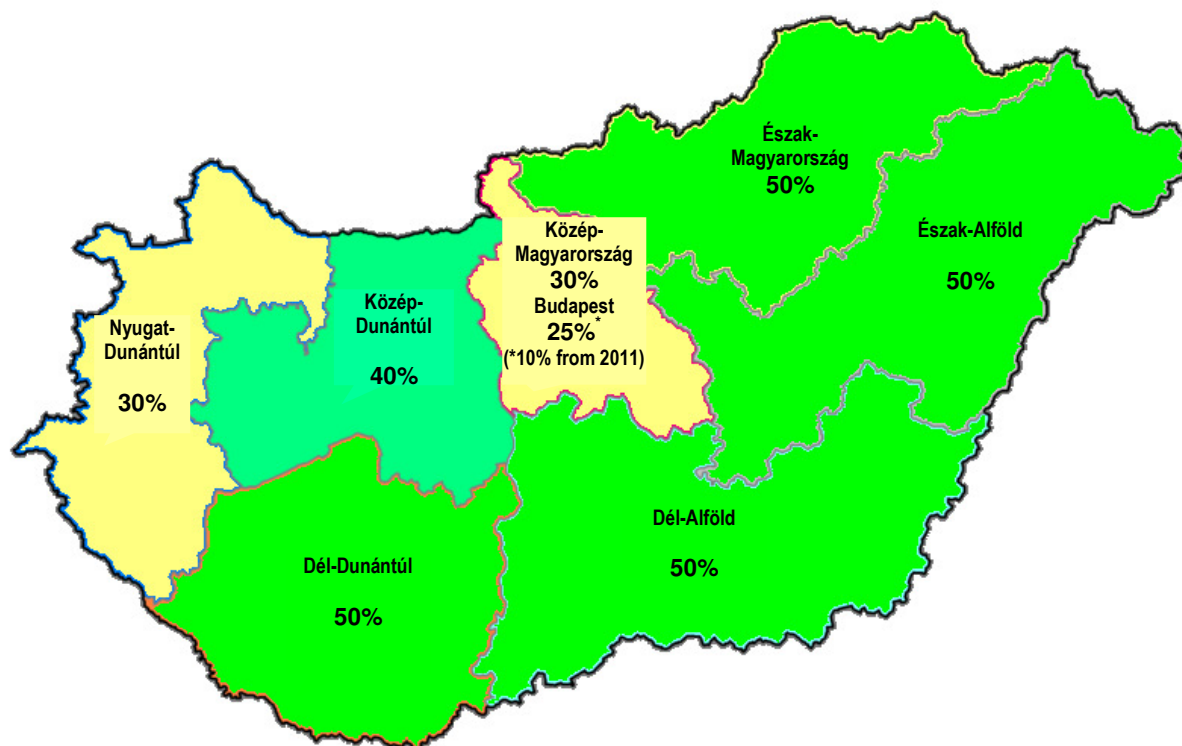


Figure 6.2.1.: Maximum ratio of regional subsidies
 (Data source: 247/2007 (IX. 26.) governmental order about the regional subsidies)

The indicated support intensity can be increased by 20% in case of small enterprises, by 10% regarding medium enterprises, but cannot exceed 50%.

ENVIRONMENT AND ENERGY OPERATIVE PROGRAM

Since 2009 four different constructions deal with projects aimed at supporting the use of renewable energy sources, while only one had previously been available. One of the main reasons behind the revision and the enlargement of the constructions was the extremely low number of applicants. In 2007 and 2008 only 19.78% of the sum available for this purpose was used. The National Development Agency, the inviter of the tenders, divided the eligible activities in more subcategories to be more transparent, and increased the maximum support intensity. In the current tender, the following four are available:

- **KEOP – 2009 – 4.2.0/B** – Local heat and cooling demand supply by renewable energy – total available source: **20 million EUR**, amount of subsidy **min. 3,300 – max. 3,3 million EUR**
- **KEOP – 2009 – 4.4.0** – Electricity- and combined heat and power production by renewable energy, and biomethane production – total available source: **33.3 million EUR**, amount of subsidy **min. 3,300 – max. 3.3 million EUR**

- **KEOP – 2009 – 5.3.0/B** – Increasing energy efficiency in public buildings in combination with renewable energy consumption – total available source: **20 million EUR**, amount of subsidy **min. 3,300 – max. 1.7 million EUR**
- **KEOP – 2009 – 5.2.0/B** – *Third party finance - Increasing energy efficiency in public buildings in combination with renewable energy consumption* – total available source: **13,3 million EUR**, amount of subsidy **min. 11,700 – max. 0.67 million EUR**

The maximum support intensities available for different target audiences and regions are as follows (table 6.2.2.)

Region (location of the investment)	Enterprises KEOP-4.2.0 KEOP-4.4.0 KEOP-5.3/B	Public and educational institutions, and non-profit organisations KEOP-4.2.0 KEOP-4.4.0 KEOP-5.3/B	In the most handicapped sub-regions					
			Municipality KEOP-4.2.0 KEOP-4.4.0 KEOP-5.3/B	Micro and small enterprise KEOP-4.2.0 KEOP-4.4.0 KEOP-5.3/B			Medium sized enterprise KEOP-4.2.0 KEOP-4.4.0 KEOP-5.3/B	
				KEOP-4.2.0	KEOP-4.4.0	KEOP-5.3/B	KEOP-4.2.0	KEOP-4.4.0 KEOP-5.3/B
Észak-Magyarország	50	60	70	60	70		60	
Észak-Alföld	50	60	70	60	70		60	
Dél-Alföld	50	60	70	60	70		60	
Közép-Dunántúl	SMEs: 50 other: 40	60	70	60	60		50	
Dél-Dunántúl	50	60	70	60	70		60	
Nyugat-Dunántúl	30 micro and small: 50 middle: 40	60	70	50	50		40	

Table 6.2.2.: Maximum ratio of the KEOP investment subsidies in the different regions in Hungary by target groups
(Data source: National Development Agency)

KEOP – 2009 – 5.2.0/B – Third party finance - Increasing energy efficiency in public buildings in combination with renewable energy consumption is not included in the summary. The reason for this is that it is a special facility, which aims to develop public institutions energetic-wise through third-party finance. In this scheme, only ESCO or third party companies can apply, and the extent of the support can uniformly be 35%.

6.3 Subsidies for establishing pellet production facilities

Pellet production facility can be established within the framework of KEOP discussed above, but only in cases where it is used in a closed system for own purposes. More suitable constructions for financing pellet plants accomplished by small and medium enterprises can be found among funds of the Economic Development Operative Program (GOP)

Economic Development Operative Program (GOP)

The GOP construction founded and by co-financed by the European Regional Development Fund and the Hungarian government contains two tenders of interest in this case. Each tender aim at enterprises, to develop their technology, thus increase their competitiveness. Eligible activities include the protection of the environment and technological developments for material- or energy-saving purposes. The two constructions are the following:

- **GOP – 2009 – 2.1.1/C** – complex technological development for enterprises, total available source: **30 million EUR**, amount of subsidy **min. 0.5 million – max. 1.3 million EUR**

Maximum ratio of the subsidy can be:

- ♦ 50% for micro and small sized enterprises,
- ♦ 40% for medium sized enterprises,
- ♦ 30% for large companies.

These rates can be different by region, according to the regional subsidy map shown at the beginning of this chapter.

- **GOP – 2009 – 2.1.2/C** – complex investments in the most handicapped sub-regions, total available source: **23.3 million EUR**, amount of subsidy **min. 0.5 million – max. 1.7 million EUR**

Maximum ratio of the subsidy can be 50% in each enterprise category, but different by region, according to the regional subsidy map shown at the beginning of this chapter.

Bank Services

Bank facilities are discussed in a different sub-chapter, as the philosophy behind them is fundamentally different than that of the non-refundable subsidies described above. However, the requirements of the two often overlap, especially since in most cases, the bank loan may

be combined with the state aid, and vice versa. There are purely market-based and state-supported types among bank loans and leasing facilities. Both versions are shown below with regard to pellet usage and/or pellet manufacturing.

Fund for Energy Efficiency Loan

In 1991 the Government of Germany granted DEM 50 million of aid to Hungary to support purchasing coal. 60% of the HUF amount of aid received was for the foundation of the appropriation of supporting energy-saving and reducing energy demand. The appropriation has been of a roll-over nature since, and besides energy saving, energy efficiency investments it supports projects promoting the use of renewable energy as well.

The Fund is aimed at financing implementations to improve energy saving, which effectively contributes to reducing the energy demand, the cost of energy of the national economy, as well as reducing pollution and dependence on imports.

The aim is to replace traditional energy sources with renewable energy or waste energy, to establish grounds for the efficient management of energy sources, to lower or eliminate energy loss with the lowest investment possible.

Possible candidates:

The promotion of the implementation of actions for energy-saving is an open tender.

Any natural or legal person and unincorporated business associations can run for the tender.

Requirements for loan:

The preferential loan may be used to finance specific investments, which can clearly show a measurable result in saving energy sources. The reduced-rate loans may be granted only to investments which are in accordance with the energy and environmental policy objectives, are technically feasible, their energy efficiency meets the requirements of modernity, and are up to the current safety and environmental standards.

Other requirements:

- at least 50% of the total cost-saving resulted by the development should be of energy cost-saving,

- the energy-saving achieved through the innovation should be at least 50 GJ/year/HUFMillion,
- the amount of the reduced-rate credit can be maximum 80% of the total budget of the investment, but it cannot exceed HUF 100 Million for each project,
- at least 20% of the total cost should be available as own resources,
- the implementation of the investment should not exceed 24 months,
- the duration of the reduced-rate loan should be maximum 6 years (including the maximum 2 years of grace period),
- already launched investments may not be tendered

Applicants must demonstrate that the investment is economical, ie, the number used to measure the internal rate of return has to reach the 80% of the current prime rate of the Central Bank. In case of investments aiming at the utilization of renewable energy it is enough if the internal rate of return is equal to the 40% of the prime rate of the Central Bank.

The rate of the loan provided from this fund is changing, as it depends on the current prime rate of the Central Bank (1/3 of it, plus the bank charges extra 2,5% interest).

If also other financial sources are used for the realization of the development, that part of the financing is dealt with the conditions given to that construction.

CIB Bank Lease service

Operating areas in the field of Energy:

- biogas power plants
- machinery of solid biomass combustion
 - ◆ stand-alone biomass combustion facilities
 - ◆ machinery of biomass production and manipulation
 - ◆ complex biomass projects
- other sustainable energetic projects

In the frame of this bank product own contribution and additional security is not necessary. The risk of implementation is borne by CIB Leasing. The financing construction is flexible, they are elaborated individually for each project. It is important to note that this construction can also be linked with the above-described non-refundable aids.

Special indicators in case of financing a pellet production facility:

- matching the raw-material and pelletising system,
- ability of providing the guaranteed yield with the pelletising system from the determined raw-material,
- guarantees for the supply of the electricity self-consumption,
- guarantees for long-term maintenance.

Unicredit Bank Lease service

Similarly to the above described constructions regarding energetic projects are based on individual evaluation. Pelletising facility and the pellet combustion machinery can also be incorporated in this, like in the previous bank service construction.

6.4 Subsidies for Agriculture

Though it is not among the topics of the paper to discuss the raw material production, but since this field appears in the incentives and direct subsidies have an important impact on the sector of pellets, in the following we are going to give a brief overview of the financing options.

Special subsidies are available to farmers in the New Hungary Rural Development Plan tender construction. These are financed by the European Fund for Agricultural and Rural Development, and among those you can find some that support the energy crop cultivation and some that are specifically intended to enhance investments focusing on the use of renewable energy within agriculture.

The following types of support are available for farmers only:

- **Establishment of wood plantation for energetic purpose** - The subsidy comes down to root suckering wood plantation, or its maintenance up till the first harvesting.
Maximum rate of subsidy: 40-60%
- **Establishment of energy crop plantation for energetic purpose** – The subsidy comes down to planting perennials. Plants suitable for subsidy are energy grass and *miscanthus*.
Maximum rate of subsidy: 40-60%
- **Biomass combustion technology purchase** – supports the purchase and installation of biomass boiler to be used for energy supply of agricultural purposes.
Maximum rate of subsidy: 35%, maximum sum of subsidy: 100,000 EUR

- **Energy Crop Premium** – supplementary subsidy 45€/hectare for the producer of the energy crop. A contract of the market take over is a prerequisite for this support.

7. Agripellet

We haven't dealt with the different types of pellets consciously so far in our work, because there is a wide range of international and Hungarian literature available regarding pelletization, combustion types and physical and chemical parameters. However, we are doing this regarding the agripellet produced from non-arboreal plants. The reasons of this are on one hand there are much less international and Hungarian literature available about agripellet than wood pellet and on the other hand in parallel much less experience regarding its combustion parameters. Further reason is that Hungary has much more potential on the field of agripellet- than wood pellet-production. At the same time agripellet faces a market niche today, where Hungarian companies could be leaders even on international level. On the different markets in western-Europe, more and more discussion is being on the possible role of agripellet, as the increasing need from the side of supply of wood pellet is not sustainable any more. New sources and raw materials are needed then to serve the growing demand of pellet, but the compatibility of different systems is still questionable.

It is often mentioned as a handicap that agripellet utilisation needs a totally new combustion technology than in case of wood pellet. In another viewpoint this disadvantage could be transformed to a big advantage if the development of agripellet boilers influences the enlargement of agripellet. They could strengthen each other, which could help to create a strong new market.

As we could see from the results of the survey, production and development of agripellet and agripellet boilers already exist in Hungary.

The key problem with the combustion of agripellet or any other non-arboreal plant is that the ash is melting at lower temperature level than the wood pellets. This melting process can be started at 400C⁰ depended on the type of the raw material. Then the melted ash can be attached to the internal parts of the stove to clog the tubes. In addition, because of the chloride and potassium content of the non-arboreal plants and the appearance of these components in the exhaust gas in the form of potassium-chloride it can be a very corrosive process. There are different possibilities depending on the different utilization to avoid this. One option can be the co-firing technology where the pellet or non-arboreal chips is mixed with coal dust. The sulphur and aluminium silicate content of the coal are helping to avoid clogs. This solution can be used at large power plants. To avoid the same in small scale, households or public buildings the best option is scaling the flow system according to the size and capacity of the pellet boiler. (Carborobot Kft. – 2009).

As a result of this problem it is a general rule that wood pellet can be combusted in an agripellet-stove but the system is not complementary on the other way round.

Agripellet could have a great role in rural development, as well, because there are lots of reserves theoretically available from the by-products of agriculture. It can help to create new market for by-products to be main product and for energy crops. To be concrete, the spread of agripellet market-wide can create a sort of **regional balance** in Hungary. While the wood pellet production concentrated in the western part of Hungary according to the forestry potentials, favourable conditions for producing agripellet can be found in the eastern part where there are large agricultural areas.

The question energy balance is also coming up in case of agripellet as it is at wood pellet. While the pellet is produced from wastes of by-products the process could have a positive energy balance. If the raw material is originated from plants cultivated directly for energy purpose, it has to be considered the energy intensity of agriculture as well in a LCA. In this case, according to some experiences the energy balance will be negative in most of the case. This is not the speciality of pellet production of course, because it is a core question in any other energetic use of biomass, like biofuel, or biogas production.

By all means future has to be the so called “multifunctional” plants and beside this it is an important task to reduce the pollution and environmental damages caused by intensive agriculture. In order to this new harvest technologies and methods have to be developed. Different calculations and experiences show that there is a big competition for the same land among the food industry and the different biomass sectors. The available land for cultivation is finite and not infinite so the total demand of food industry and energy supply cannot be satisfied separately at the same time.

Just an example for the complex impacts that intensive agriculture responsible not only for some kind of environmental damages, but for most of the problems of combustion of agripellet. Potassium responsible for low melting temperature of the ash, and chloride responsible for dioxin eruption and corrosion are got into the system during fertilisation and pest control. (Fenyvesi, Ferencz, Tóvári – 2008)

The problem of course is far too complex to cry out for a blow to the agriculture for all the problems, so we emphasize that the complex solutions are needed.

In the followings we introduce the agripellet in more detail.

7.1 Raw material

The agripellet is produced mainly from the residues or agricultural production of different crops, grains etc. by pelletising them. This definition could be misleading, because wood pellet based on pelletisation of wood from woody stalk plantation which produced by intensive agricultural harvesting technology could be classifiable according to this.

Agripellet production is exclusively based on non-arboreal plants regardless of the place of origin. So, raw material can be agricultural waste, residues, main or by-product at the same time.

The size of agripellet is different from wood pellet. It is longer, usually extruded to 10-12 mm length (see photos), then in parallel the diameter is also bigger. The heating value of different agripellets depended on the type of raw material, but it is deviated in between 16-20 MJ/kg.

Different types of agripellet



corn-stalk



straw



switchgrass



lucerne (alfalfa)

Opinions in the context of available raw material in agriculture are generally divided. For the time being we could talk about cumulated amounts and it is almost incalculable how much of them is returned to the agriculture again as litter or feed and how much of them will be utilized for industrial and energetic purpose. Our experiences show that every sector

calculating with the same amounts and none of them consider the others demand. So we can talk about theoretical potentials only on national level and probably market trends will form time to time different portfolios of utilisation.

The raw material of plants for agripellet, we can count with about 15.8-22.3 Mt/a different types of plants from agriculture, according to the opinions of experts (table 7.1.1.).

Origin	Quantity (Mt/a)
straw of cereals	3.5-5.5
corn-stalk	10-14
sunflower-stalk	1.2-1.5
reed	0.3-0.4
grass cut by roads	0.8-0.9
Total	15.8-22.3

Table 7.1.1.: Potential amount of by-products from agriculture for energetic purpose
(Data source: Fenyvesi, Ferencz, Tóvári – 2008)

The quantity is much smaller that in not only theoretical but economical potential and possible and worth to collect. According to the calculations of **Ministry of Agriculture** the really available by-products from agriculture is „only” **5.5-6.0 Mt/a**, which is the 26-37% of the above mentioned potentials. This can be completed with the quantity of energy crop production on about 300-400 ha, which could give more **5.6 Mt/a** further raw material (Varga – 2009).

7.2 Content and heating value

The heating value of agripellets is near to wood pellets and the real differences are in the ash and chloride content (table 7.2.1.). It can be followed well how the values are slipping in these cases comparing to wood pellets.

Type of pellet	N	C	S	H	O	Cl	H ₂ O	Ash	Heating value (dry material) MJ/kg
"woody"-stalked									
Poplar pellet	0.18	45.6	0.11	4.8	41.2	0.001	6.4	1.8	18.0
Beech pellet	0.18	45.8	0.06	5.6	39.9	0.001	7.8	0.6	19.0
Pinewood pellet	0.1	48.3	0.1	5.3	39.7	0.006	6.2	0.2	19.1
Willow pellet	0.8	44.6	0.1	4.7	38.0	0.03	7.5	4.3	18.1
Myscanthus pellet	0.2	45.3	0.1	4.9	41.0	0.1	7.0	1.4	18.2
"soft"-stalked									
Sorghum pellet	0.7	42.1	0.2	4.8	37.7	0.5	6.4	7.5	16.8
Hemp pellet	0.6	43.6	0.15	4.8	40.8	0.1	6.7	3.4	17.2
Recipe pellet	0.1	47.5	0.1	5.4	39.8	0.02	6.8	0.3	20.2
Straw pellet	0.7	40.1	0.2	3.9	37.2	0.9	9.2	7.8	16.7
Switchgrass pellet	1.5	46.4	0.2	6.0	31.4	0.1	8.8	5.5	17.2

Table 7.2.1.: Content and heating values of different pellets
(Data source: Fenyvesi, Ferencz, Tóvári – 2008)

In the aspect of emissions, important components are N and S, which can spectacularly higher than in case of wood pellets.

Critical Cl and K content can be reduced by mechanical solutions like washing out by water. This method slows down drying out of the material and increasing the danger of decaying of raw material, which is inherently higher at non-arboreal plants. Washing out can be carried out on natural way as well, if cut plants are keeping on lands as long as possible. Drying out of it can be also carried out by proper and regular restructuring in order to avoid decaying. However, washing out is reducing the heating value of the raw material up to 6% (Fenyvesi, Ferencz, Tóvári – 2008).

7.3 Agripellet vs. wood pellet

In the followings we summerize the main features and parameters of agripellets and wood pellets in order to compare these two types of solid biomass fuels (table 7.3.1.). We emphasize that agripellet will never have the same quality and emissions with the present basis of raw material, as wood pellet has. But there are many regions where it is impossible to produce wood pellet because of the scarcity of raw material, but there are far more raw material is available from agriculture. This basis of raw material in those regions could mean local energy resource and fossil energy sources can be replaced by it.

Indicator	Agripellet	Wood pellet
Raw material	main and by-product and waste from agriculture	by-product and waste from wood industry
Heating value MJ/kg	14-20	18-20
Ash content (%)	2-12	0.25-2
Ash melting point C	400-600	800-1300
Market penetration at present	regional	worldwide
Areas of utilisation	combustion in agripellet stoves litter of pets	combustion in agripellet or wood pellet stoves
Potentials in Hungary	high	small
Available standards	Ø or CEN partly	SS 187120 (Sweden) DIN 51731 (Germany) ÖNORM M1735 (Austria) CEN/TS 14961 (EU)

Table 7.3.1.: Main indicators of wood pellets and agripellets
(Data source: Deák – 2009, Fenyvesi, Ferencz, Tóvári – 2008)

8. Pellet market building in Hungary

Issues having been discussed so far and the results of surveys carried out in the framework of this work make it clear that Hungary is still a fairly disorganized pellet market, it might also be described as chaotic. In order to facilitate the development, it is important to elaborate adequate responses in the different sectors, like for technological, environmental, economic and social issues. A market development strategy has to give answers to special questions, but it also has to be integral, it can not be taken out of its corresponding joint surfaces, it must have overlaps with at least the energy-, support- and the environmental policy. This has to be given on both national and EU level, otherwise good initiatives may fall soon, and the pelletisation cannot leave its isolation.

This is a suitable period to create harmony between the energy policies of the EU and Hungary, as the target ratio of renewable energy to be accomplished by 2020 makes the governments more open to proposals coming from below.

It is also important that the development of the pellet market should be carried out in a well-regulated and not in ad-hoc manner, as the consequences will be similar to what happened in Western Europe previously (see chapter 3., page 14.)

In the following, first we summarize the areas in which progress is needed to develop a well-functioning market in Hungary. These steps, however, should be drawn up in detail and specific proposals should be formulated by professionals. These professional could be in an umbrella organization from departmental partner organizations, or a governmental institute specialized in the area. The former seems to be more appropriate for the task and more likely to be formed, which as a grass-roots initiative can respond better to issues of the people involved in this sector. The chances of the latter- a lobby formulated from above- are minimal, and the chances that it would work effectively are even less. Both versions have advantages and disadvantages, but we see a greater chance for the grassroots organization also in terms of functioning effectively, but only on condition that they can develop appropriate contacts with the public authorities.

Besides governmental channels it is very important that this sector and its lobby should be open for other lobbies in the renewable energy sector. To do so, it is important to identify the points where acting together and working out solutions for the benefit of everyone concerned will be more effective. These words might seem just phrases, but the author also has some personal experience that in Hungary it is not only the strong fossil- and nuclear lobby make the situation of renewable energy difficult, but at least as much the internal division.

Therefore, somewhere each association concerned with renewable energy should work together in the same way as the clusters, where the market competitors find their common interests and act together to create a favorable market environment.

It has not been very long, but there is a body in Hungary to perform the above tasks. The Hungarian Pellet Association was founded in 2008 and since the summer of 2009 it has been working as a cluster. Its members and founders are also market participants, like pellet and boiler manufacturers and distributors. Appropriate professional experience is given, they have common interest, and they are sufficiently agile in a good meaning of the word. They organize more and more professional and public forums, or have their voices heard in similar forums, they have also elaborated sector strategies for the decision-makers. Its members are interested in the regulated market development, which serves to establish a long-term development. The organization's operational efficiency cannot be judged accurately because of the relatively short operational time, but in any event, the experiences so far are encouraging.

8.1 Areas of intervention

In the following we identify the key areas where progress will be required in the short term to develop a well-functioning pellet market. These areas are not prioritized on purpose because the list is not in order of importance; the interventions are to be made more or less at the same time.

Public awareness raising

Quite limited amount of information is available for the users with regard to the pellet heating. This is true for all levels from the residents, the small and medium sized enterprises to the government. Of course, now a lot of information can be collected -also in Hungarian - surfing the internet, but it is still limited, and in addition there are few number of pages with information of independent sources. However, in order for someone to search this topic on the web, their attention should be raised, for which carrying out a major information campaign is needed.

Of course, it can be recognized easily that due to the natural gas crisis the public is more open to and interested in renewable energy sources.

It is necessary to develop information materials, including not only general descriptions, but also specific information in a simple language for example about the composition of the

pellets, different sources of supply, consequences of using different quality of pellets, and also what to look out for when purchasing.

Based on the survey it was shocking that also current pellet users are struggling with serious lack of information.

HUNGARIAN STANDARD FOR AGRIPELLET

For a well-regulated market development it is essential that the pellets as fuel have to have official standards, which are mandatory for the different pellets to come to the market in order to protect consumers. The survey showed that a part of the wood-pellet manufacturers is already prepared or produce pellets meeting the major European quality standards, especially if they export large quantities to the European markets. However, it was found from our survey that certain interest groups do not find the existence of market standards a particularly important factor in the development of the pellet market (Figure 9.1.). This may indicate that the market participants have not yet recognized the importance of this, so there might be needed some awareness raising work in the near future.

The market standard does not protect the consumer only, but the producers, traders as well. A number of complaints coming from producer and consumers can be heard in relation to certain periods when multinational retailers are flooded with poor quality pellets imports. The result of this can be that the producer is crowded out of the market by the dumping price, and the consumer having sooner or later realized that the cheap pellets of uncertain sources can cause damage to their equipment, but also due to lack of adequate information they can be disappointed with the pellet heating itself. The latter can put the sector into a negative spiral, which is anyway still wobbly.

In case of the wood pellet it is a positive fact, if they comply with the German or Austrian market standards, and thus with the common European standards, but it may be useful to develop a national standard based on the Hungarian circumstances regarding wood-pellets. Regarding the agripellet it is absolutely necessary to develop domestic standards. As in this case there is no chance to meet Western European standards developed for wood-pellets, since the raw material used is of completely different characteristics (see chapter 7). Hungarian companies specialized in agripellet production and manufacturing agripellet fuelled heating machinery still do have a good chance to apply for the European market leader role. Besides meeting many other requirements working out and having accepted a Hungarian agripellet standard could be a very important step. Later this standard could be

the basis of legislation becoming necessary also on the European level with the growth of market.

STATE SUPPORTS AND INCENTIVES

Regarding renewable energy consumption it is common today that market actors are lobbying for state subsidies. This is one reason why critics say often that renewable technologies are not able to survive on the market without state support and it is worthless to spend public money for these technologies. Even the author is not standing for state subsidies by any means, but we have to see that renewable technologies could be viable in market conditions if the market was equal. Unfortunately, we can rather experience distort market conditions, because the states spend much more money, direct or indirect, to subsidize fossil energy sources than renewables.

Other negative effects are that the major amount of money spent on renewables today is financing out-of-date technologies in Hungary. As a consequence, the country is wasting valuable biomass sources now.

In general, the state has direct and indirect tools in subsidizing policy. These tools can be used in the existing structure, because there are direct subsidies for residential, public and business sectors. However, these are not popular, because of the low rate of intensities, small available sources, difficult and bureaucratic application system.

Beside direct supports, tax incentives could have a serious role in inciting the market development. One of the key actor is the V.A.T. In many European countries, preferential V.A.T. rate is being used for pellets and besides supporting purchase of pellet boilers at the same time. Nowadays in Hungary, the actors of the market are lobbying for this with the Hungarian Pellet Association.

Our opinion is that it can be an efficient tool, but at this point it could be worth to communicate with other sectors of renewables, because this tool would be useful for promoting other technologies as well. E.g. in case of solar collectors it was also an efficient subsidy some years ago, which was unfortunately eliminated. A constructive package of proposals for the whole renewable sector would be more welcome by the decision-makers who have to make a strategy to reach the EU targets by 2020.

We can say that during a global economic crisis when the Hungarian government had to radically cut state expenses, a proposal of tax reduction does not make any sense. On the other hand, every incentive is a kind of investment where we expect that the development of the market which will compensate and accelerate the invested money.

As we stated before (chapter 6.), the formation of the distort market and low market penetration of renewables is due to the subsidizing of using natural gas consumption at households. The reduction and phasing out of this kind of subsidy can also be an indirect incentive for the development of renewable energy market and also for the pellet sector, as well because the experiences so far have shown that when the gas prices are increasing, more and more people and public institutions start to think about alternatives. Unfortunately, it is possible as it has happened earlier that these people and public institutions turned to cheaper, less efficient and more pollutant biomass or other waste burning technologies, thus the reduction of fossil subsidies are not enough, but the above mentioned incentives are also inevitable at the same time in order to promote real „green” and clean technologies.

Another incentive could be if the state started a separate programme for modernizing the public and municipal buildings where pellet can has a significant role beside other renewable technologies. This can create a stable domestic market for Hungarian pellet- and boiler producers which can be a basis of a long-term development.

INNOVATION

The Hungarian small and medium-sized enterprises can generally spend very little on innovation, whether it is the product, the technology or the production process. Of course there are exceptions also among the participant of the pellet market, who could “drag” the others as well. The following areas will definitely need innovative solutions in the near future for the development of the pellet market:

PELLETISING TECHNOLOGY

Especially in relation to agripellet an important development area is the development of pelletising equipment in the direction that a steady quality should be ensured also by using more than one raw material. As the agricultural products and wastes are available in varied forms, economical systems can be operated if a wide range of raw materials can be processed.

AGRIPELLET STOVES

Though today we can already find agripellet stoves on the market, but in order to make them competitive to wood-pellet fuels – as well as on international markets - similarly complex systems will be needed to develop.

On the other hand it is a challenge - partly true for wood-pellet fuels, but especially in the case of boilers using agripellet - to further reduce pollution emission. As with the spread of pellet heating NO_x – s and S_2O can cause a serious problem in the nearby residential areas.

PLANTATION

In order to establish the plantation of crops producing the raw material for agripellet and wood-pellet, in the future it may be necessary to create plants that are not only useful for energy purposes, but also so-called "Multifunctional" plants. These plants can be very important to the farmers' point of view, if they do not want to commit themselves to one market only.

The breeding of this kind have a long tradition in Hungary, which provide a good basis for future developments and provide appropriate market advantages in the international arena, for the pellet sector, too.

The breeding must comply with the environmental aspects as well, and the innovation must be open to this direction, too, in order to reduce environmental impacts caused by intensive agriculture.

The development of harvest technologies and methods is closely linked to the raw material production to ensure that the previously (chapter 7.) described theoretical potentials could be more exploitable for the energy sector.

EDUCATION

In all sectors “doomed” for development education plays a huge role. All areas discussed above at the innovation-demand will need new experts and train professionals. However, there is a need also for the training of heater repairmen, or even chimney sweepers to ensure that they should have appropriate knowledge about pellet heating among other renewable energy technologies, so they can serve the increased consumer demand.

Moreover, it is not vital in the short and medium term, but in the long run the awareness raising among children can play an important role in the development of the market. "Taking advantage" of the children's high susceptibility often makes it easier to reach the parents with the information, than creating the same level of interest by any other means.

9. Conclusion

As a summary we can conclude that though the pellet market in Hungary is in a starting phase, it has large reserves also in the field of raw material production as well as technological developments of the field. This can create an adequate basis for reaching a market-leading position on international level, provided the market participant have common interest in a well-organized, steady development, and are willing to act for it, plus the domestic energy policy ensures an appropriate background.

The sector has a good chance on the level of the decision-makers, since a number of important political strategy could be implemented with the help of the pellet sector, these strategies are the energy, the climate- and rural development strategies.

Consumers, users also show increasing interest in new, alternative energy to replace the import and more and more expensive natural gas. Besides residents local governments can play a significant role in this, who are also increasingly interested in using technologies in their institutions which can take advantage of local opportunities, especially if these technologies can contribute to keep or increase the population by creating new workplaces and local income.

In this paper a number of factors have been listed and analyzed, which are obstacles or challenges for the market development to a less or greater extent. Let us see now, what the market players themselves think about this, what they think is slowing, impeding or setting back the development of the domestic pellet market.

In this survey we formed this question as a common one in the questionnaire for all the three sectors, to be able to analyze the answers later. The respondents had to mark each category from 1-to 5, giving the smaller number when it has a low impact, and giving a higher number if it is a major factor hindering the development of the market. Then the scores were summed by category and by market participants, and the results for each category were then prioritized by the market participants. On this basis, we identified the factors which the market participant evaluated as the biggest barriers.

On this basis, there were surprising results, or opinions different from ours, and there were also less surprising ones, which were already expected at the beginning of the survey.

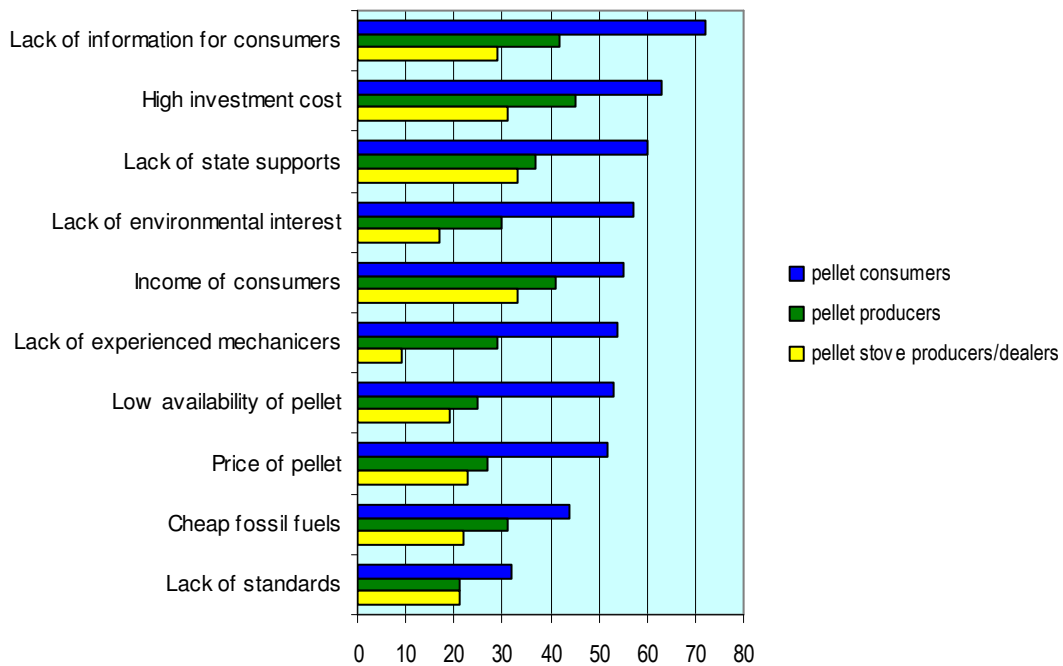


Figure 9.1.: Main barriers of pellet market development in Hungary in 2009
(Data source: own survey, 2009)

It can be seen from the figure that pellet users put the lack of information to the first place, while the pellet producers put the high investment cost of the pellet heated systems. At first one would think that consumers are those who think the price of the heaters is high, but it is possible that this is due to the relatively small number of samples. At the same time it is even more interesting that only the pellet stove producers indicated the lack of state aid in the first place. This is also understandable, since their market heclicly follows the situation of the state subsidies given for the purchase of equipment.

Further results are similar or different to a smaller extent among the various market participants. However, one factor deserves special attention, and this is the lack of market standards, which three of the two groups listed as last, and the third participant also did not think it would be the most important hindering factor in Hungary today. It is interesting because we had previously found that it is a vital point in the long-term market development if a Hungarian standard is to be introduced regarding pellets, which would technically protect all market participants. Currently, the market participants do not seem to realize the importance of it and consider other factors more critical.

There are basically two options for the participants of the pellet market to initiate the market growth. On the one hand, they can wait for external help from the state, in the form of subsidies and incentives, from the EU through the increase in demand, but we believe that this can boost the market only for a very limited period of time. On the other hand, they can

begin to systematically build up the domestic market from the bottom, and they can also benefit from crises related to the fossil energy sources, the climate, the environmental perspective, as well as the increasing need for energy autonomy. In our opinion the latter approach could be the basis of a truly sustainable development, which of course requires a greater effort on behalf of the market participants, but it also help the pellet sector to become unavoidable in the energy-, in particular in the renewable energy policy.

Acknowledgements

I would like to express my thanks for the professional support to prepare this thesis for my supervisor Prof. Miklós Neményi Úrnak. Besides, for colleagues of the Hungarian Pellet Association providing assistance in the market research of pellet, and last but not least to my trainee colleague Mr. Balázs Kozák, who helped me to carry out the survey.

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APPENDIX

1. Questionnaire for pellet producer companies

➤ **Az Ön üzemének késztermék profilja?**

- a) Fapellet
- b) Agripellet
- c) mindkettő

➤ **Az Ön cége által teljes-, vagy részmunkaidőben alkalmazott munkaerő létszáma 2008-ban: fő**

Amennyiben nem kíván pontos létszámot közölni, kérjük, válasszon az alábbi kategóriák közül:

- a) kevesebb, mint 5 fő
- b) 5-10 fő
- c) 15-20 fő
- d) 20-50 fő
- e) Több mint 50 fő

➤ **Az üzem termelési kapacitása/forgalma 2008-ban: t/év**

Amennyiben nem kíván pontos mennyiséget megadni, kérjük, válasszon az alábbi kategóriák közül:

- a) kevesebb, mint 100t/év
- b) 100-300 t/év
- c) 300-600 t/év
- d) 600-1000 t/év
- e) 1000-5000 t/év
- f) 5000-10000 t/év
- g) 10000-50000 t/év
- h) Több, mint 50000 t/év

➤ **Az üzem tervezett termelési kapacitása/forgalma 2009-ben: t/év**

Amennyiben nem kíván pontos mennyiséget megadni, kérjük, válasszon az alábbi kategóriák közül:

- a) kevesebb, mint 100t/év
- b) 100-300 t/év
- c) 300-600 t/év
- d) 600-1000 t/év
- e) 1000-5000 t/év
- f) 5000-10000 t/év
- g) 10000-50000 t/év
- h) Több mint 50000 t/év

➤ **A 2008-ban termelt pellet mennyisége: t/év**

Amennyiben nem kíván pontos mennyiséget megadni, kérjük, válasszon az alábbi kategóriák közül:

- a) kevesebb, mint 100t/év
- b) 100-300 t/év
- c) 300-600 t/év
- d) 600-1000 t/év
- e) 1000-5000 t/év
- f) 5000-10000 t/év
- g) 10000-50000 t/év
- h) több, mint 50000 t/év

➤ **Az exportra termelt pellet aránya: %**

Amennyiben nem kívánja a pontos arányt megadni, kérjük, válasszon az alábbi kategóriák közül:

- a) 10-20%
- b) 20-30%
- c) 30-50%
- d) 50-70%
- e) 70-90%
- f) 90-100%

➤ **Az előállított/forgalmazott pellet minőségi osztálya, külföldi szabvány szerinti besorolása**

- a) DIN
- b) ÖNORM
- c) CEN
- d) Nem minősített

➤ **A pellet előállításához felhasznált alapanyag forrása:**

Alapanyag forrás	Aránya a teljes felhasználáson belül
Faipari hulladék	
Erdészeti hulladék/melléktermék	
Mezőgazdasági hulladék/melléktermék (lágyszárú)	
Fásszárú ültetvények	
Lágyszárú ültetvények	
Egyéb (Kérjük nevezze meg!)	

- **A pelletgyártáshoz szükséges alapanyagokat milyen távolságból szerzi be?**
- 0-25 km-en belüli vonzáskörzetből
 - 25-50 km-en belüli vonzáskörzetből
 - 50-75 km-en belüli vonzáskörzetből
 - 75-100 km-en belüli vonzáskörzetből
 - 100-150 km-en belüli vonzáskörzetből
 - 150-200 km-en belüli vonzáskörzetből
 - 200 km-nél messzebből
- **A pelletgyártáshoz szükséges alapanyagot milyen forrásból szerzi be?**
- Faipari vállalkozás
 - Erdészet
 - Mezőgazdasági vállalkozás
 - Egyéb (kérjük nevezze meg)
- **Az Ön cége, a megtermelt pellet hány százalékát forgalmazza az alábbi távolságtartományokban?**
- 0-200 km-re%
 - 200-400 km-re%
 - 400-600 km-re%
 - 600-800 km-re%
 - 800-1000 km-re%
 - 1000km-nél távolabbra%
- **Hogyan alakul az Ön cége vevőkörének megoszlása?:**
- Pellet kereskedő/forgalmazó cég%
 - Közüintézmény%
 - Családi házas, otthoni felhasználás%
 - Társasház%
 - Erőmű%
 - Távfüttőmű%
 - Kereskedelmi létesítmény%
 - Ipari létesítmény%
 - Egyéb%
- **A megtermelt pelletet hogyan juttatják el felhasználóikhoz? Kérjük, válasszon az alábbi kategóriák közül és egyben jelölje az adott típus hány százalékot képvisel a teljes értékesítésből.**
- 10-50 kg-os kiserelésben%
 - 500-1500 kg-os nagyzsákos kiserelésben%
 - Ömlesztve teherautóval/kamionokkal%
 - Telephelyen értékesítik%
 - Egyéb (kérjük, nevezze meg)%

- **1-5-ig tartó skálán értékelje, hogy az egyes tényezők mennyire hátráltatják a pellettüzelés elterjedését! (5 – nagyon jelentős mértékben hátráltatja; 1- egyáltalán nem hátráltatja)**

Fogyasztók tájékoztatlansága:

Fogyasztók anyagi helyzete:

Fogyasztók környezettudatosságának hiánya:

Tűzipellet ára:

Tűzipellet-beszerzés nehézségei:

A pellettüzelésben járatos szakképzett munkaerő hiánya:

Fosszilis tüzelőanyagok alacsony ára:

Pellettüzelés beruházási költségei:

Piaci szabványok hiánya:

Állami támogatások hiánya:

- **Egyéb észrevétel a kérdőívvel, illetve a piaci viszonyokkal kapcsolatban**

Köszönjük válaszait!

2. Questionnaire for pellet consumers

1. A felhasználó típusa (kérjük, karikázza be az Önre vonatkozót)

- j) Közintézmény
- k) Irodaház
- l) Családi ház
- m) Társasház
- n) Távfűtőmű
- o) Erőmű
- p) Egyéb kereskedelmi létesítmény
- q) Üzemcsarnok
- r) Egyéb (kérjük, részletezze)

2. A felhasználás célja (Kérjük, karikázza be az Önre vonatkozót, értelemszerűen akár többet is)

- a) Fűtés
- b) Használati melegvíz termelés
- c) Villamosenergia-termelés

3. A pellettüzelés hány százalékban fedezi energiaigényét?

A fűtési hőigény.....%-át,
A használati melegvíz előállítás.....%-át
A villamosenergia-igény.....%-át

Amennyiben ez nem 100 %, milyen más energiahordozót használnak a pellettüzelés mellett? (kérjük, karikázza be az Önre vonatkozó(ka)t)

- a) Szén
- b) Olaj
- c) Földgáz
- d) Hálózati villamos energia
- e) Napenergia
- f) Földhő
- g) Egyéb biomassa
- h) Egyéb (kérjük részletezze)

4. A beépített pelletkazán típusa (kérjük, adja meg a pontos paramétereket)

A, központi fűtésrendszerű

B, helységfűtő berendezés

Gyártó:

Teljesítmény:

Automatikus adagolás: igen/nem

5. Hány m²-es lakást/helységet fűt vele?

..... m²

6. Igénybe vett-e valamilyen pályázati támogatást a beruházáshoz?

Igen/nem

Ha igen, milyen és milyen arányban?

.....

7. Milyen finanszírozási formában valósult meg a beruházás? (Természetesen többet is megjelölhet!)

- a) Saját tőke bevonásával
- b) Önkormányzati támogatással
- c) Pályázati támogatással
- d) Banki hitellel
- e) Harmadik feles finanszírozásban
- f) ESCO típusú beruházással
- g) Lízing keretében
- h) Egyéb (kérjük, fejtse ki)

8. A pelletkazán üzembehelyezése óta eltelt fűtési szezonok száma (amelyekben a pellettüzelés szolgáltatja az energiát)

.....

9. Milyen energiahordozót váltottak fel (ha volt ilyen) a pellettel?

- a) Szén
- b) Olaj
- c) Tűzifa
- d) Hálózati villamos energia
- e) Egyéb (kérjük, részletezze)

10. Van-e lehetősége alternatív tüzelésre például üzemeltetési probléma esetén?

11. Milyen mennyiségben használ pelletet egy fűtési szezonban?

.....t / fűtési szezon

12. Mennyire elégedett a pellettüzelési rendszer működésével az alábbi kategóriák alapján? Kérjük 1-5-ig tartó skálán értékelje!

Megbízhatóság:	Kényelem:	Alapanyag-ellátottság:
5 - Nagyon megbízhatóan működik	5 - Alig igényel kezelést, karbantartást	5 - Több pellet beszerzési forrás is elérhető távolságban van
3 - Többnyire megbízhatóan működik (kisebb rendszerhibák)	3 - Átlagos	3 - Egy pellet beszerzési lehetőség van környéken
1 - Nagyon megbízhatatlanul működik (többszöri leállás, nagy karbantartásigény)	1 - Kényelmetlen, sok karbantartást igényel	1 - Nehéz a pelletet beszerezni

13. Honnan szerzi be a tüzelőanyagot?

- a) Közvetlenül a gyártótól, telephelyről
- b) Forgalmazótól
- c) Saját maga állítja elő
- d) Egyéb beszerzési forrás (kérjük, nevezze meg)

14. Milyen kiszerelésben vásárolja a pelletet?

- a) 15-20 kg-os zsákokban
- b) 500-1000kg-os bigbag zsákokban
- c) ömlesztett silótartályos kiszerelésben
- d) egyéb (kérjük, nevezze meg)

15. Mekkora mennyiségben vásárol egyszerre pelletet?

- a) 1 hónapnál kevesebbre elegendő mennyiséget
- b) 1-3 hónapra elegendő mennyiséget
- c) 4-6 hónapra elegendő mennyiséget
- d) 7-9 hónapra elegendő mennyiséget
- e) 10-12 hónapra elegendő mennyiséget
- f) 1 évnél hosszabb időre elegendő mennyiséget

16. Milyen távolságról szerzi be a szükséges mennyiségű tüzelőanyagot?

- a) 0-10 km
- b) 10-30 km
- c) 30-60 km
- d) 60-100 km
- e) 100 km-nél távolabbról

17. Házhoz szállíttatja-e a tüzelőanyagot?

Igen/nem

18. Alkalmilag vásárolja a pelletet vagy szerződés alapján?

.....

19. Elégedett-e a jelenleg használt pellet minőségével?

Igen/nem

20. Tapasztalt-e minőségi eltérést, vagy problémát a vásárolt pellettel/pelletekkel kapcsolatban?

Igen/nem

21. Figyeli-e a pellet minőségét a vásárláskor?

- a) Igen
- b) Nem
- c) Nem tudom, mit kell figyelni

22. Milyen szempontokat figyel?

.....

23. Ismeri-e a pellet minőségi követelményeit?

Igen/nem

**24. Ön vásárlása során mely paraméterek szerint minősíti a vásárolandó pelletet?
Állítsa fontossági sorrendbe:**

- a) Szín
- b) Pellet töredezettsége
- c) Fűtőérték
- d) Nedvességtartalom
- e) Csomagolás minősége

25. Keresi-e Ön a vásárolandó pellet gyártmány kísérő lapját?

Igen/nem

26. Elégedett-e a jelenleg használt pellet árával?

- a) Igen, nagyon kedvező számomra,
- b) Igen, éppen megfelelő,
- c) Az ár/érték arányt tekintve magasnak gondolom,
- d) Nagyon magas

27. Elégedett-e a pellettüzelés üzemeltetési költségeivel?

Igen/nem

28. Hol tárolja a tüzipelletet?

- a) Külön erre a célra kialakított speciális tároló helységben
- b) Egy átlagos tároló helységben
- c) Közvetlenül a kazán mellett
- d) Egy másik épületben

29. Miért választotta a pellettüzelést? (akár több választ is bejelölhet)

- a) Működtetési költségei alacsonyabbak, mint a korábban használt energiahordozó
- b) Telepítési költségek alacsonyabbak, mint más energiahordozók esetében
- c) Más energiaforrás bekötése gyakorlatilag lehetetlen
- d) Környezetbarát
- e) Korszerű új technológia
- f) Pályázat igénybevételelével megérte a beruházás
- g) Kényelmes
- h) Hazai energiahordozót használ
- i) Egyéb ok (kérem, nevezze meg)

30. 1-5-ig tartó skálán értékelje, hogy az egyes tényezők mennyire hátráltatják a pellettüzelés elterjedését! (5 – nagyon jelentős mértékben hátráltatja; 1- egyáltalán nem hátráltatja)

Fogyasztók tájékoztatatlansága:

Fogyasztók anyagi helyzete:

Fogyasztók környezettudatosságának hiánya:

Tüzipellet ára:

Tüzipellet-beszerezés nehézségei:

A pellettüzelésben járatos szakképzett munkaerő hiánya:

Fosszilis tüzelőanyagok alacsony ára:

Pellettüzelés beruházási költségei:

Piaci szabványok hiánya:

Állami támogatások hiánya

31. Egyéb észrevétel a kérdőívvel, illetve a piaci viszonyokkal kapcsolatban

Köszönjük válaszait!

3. Questionnaire for pellet stove manufacturers

- **Az Ön cége által teljes-, vagy részmunkaidőben alkalmazott munkaerő létszáma 2008-ban: fő**

Amennyiben nem kíván pontos létszámot közölni, kérjük, válasszon az alábbi kategóriák közül:

- f) kevesebb, mint 5 fő
- g) 5-10 fő
- h) 15-20 fő
- i) 20-50 fő
- j) Több mint 50 fő

- **Az üzem összes termelési kapacitása 2008-ban: db/év**

Amennyiben nem kíván pontos mennyiséget megadni, kérjük, válasszon az alábbi kategóriák közül:

- i) kevesebb, mint 100db/év
- j) 100-300 db/év
- k) 300-600 db/év
- l) 600-1000 db/év
- m) Több mint 1000 db/év

- **Az üzem összes tervezett termelési kapacitása 2009-ben: db/év**

Amennyiben nem kíván pontos mennyiséget megadni, kérjük, válasszon az alábbi kategóriák közül:

- a) kevesebb, mint 100db/év
- b) 100-300 db/év
- c) 300-600 db/év
- d) 600-1000 db/év
- e) Több mint 1000 db/év

- **A 2008-ban gyártott/forgalmazott pelletkazánok száma: db/év**

Amennyiben nem kíván pontos mennyiséget megadni, kérjük, válasszon az alábbi kategóriák közül:

- a) kevesebb, mint 100db/év
- b) 100-300 db/év
- c) 300-600 db/év
- d) 600-1000 db/év
- e) Több mint 1000 db/év

➤ **Az exportra gyártott pelletkazánok aránya: %**

Amennyiben nem kívánja a pontos arányt megadni, kérjük, válasszon az alábbi kategóriák közül:

- a) 10-20%
- b) 20-30%
- c) 30-50%
- d) 50-70%
- e) 70-90%
- f) 90-100%

➤ **Az Ön cége által gyártott/forgalmazott kazánok típusai:**

- Helységfűtő berendezés
- Központi rendszerű fűtőberendezés
- mindkettő

A beépített teljesítmény szerint:

• **helységfűtő berendezés:**

.....kW
.....kW
.....kW
.....kW
.....kW

• **központi rendszerű fűtőberendezés:**

.....kW
.....kW
.....kW
.....kW
.....kW

➤ **Az Ön cége által előállított/forgalmazott kazánok hány százalékban származnak saját fejlesztésből?**

.....%

➤ **1-5-ig tartó skálán kérjük, értékelje, hogy Ön szerint a Magyarországon gyártott kazánok mennyire versenyképesek a külföldi vetélytársakhoz képest? (5 - versenyképes; 1 - nem versenyképes)**

- **Kérem, röviden fejtse ki miért vagy éppen miért nem versenyképesek?**

- **1-5-ig tartó skálán értékelje, hogy az egyes tényezők mennyire hátráltatják a pellettüzelés elterjedését! (5 – nagyon jelentős mértékben hátráltatja; 1- egyáltalán nem hátráltatja)**

Fogyasztók tájékoztatlansága:
Fogyasztók anyagi helyzete:
Fogyasztók környezettudatosságának hiánya:
Tűzipellet ára:
Tűzipellet-beszerzés nehézségei:
A pellettüzelésben járatos szakképzett munkaerő hiánya:
Fosszilis tüzelőanyagok alacsony ára:
Pellettüzelés beruházási költségei:
Piaci szabványok hiánya:
Állami támogatások hiánya:

- **Közvetett vagy közvetlen értékesítési csatornákat alkalmaz?**
 - a) Multinacionális láncon keresztül
 - b) Kiskereskedelmi üzletláncon keresztül
 - c) Saját hálózaton keresztül

- **Egyéb észrevétel a kérdőívvel, illetve a piaci viszonyokkal kapcsolatban:**

Köszönjük válaszait!