Efficiency of energy chips production from logging residues by the chipper Bandit 2090

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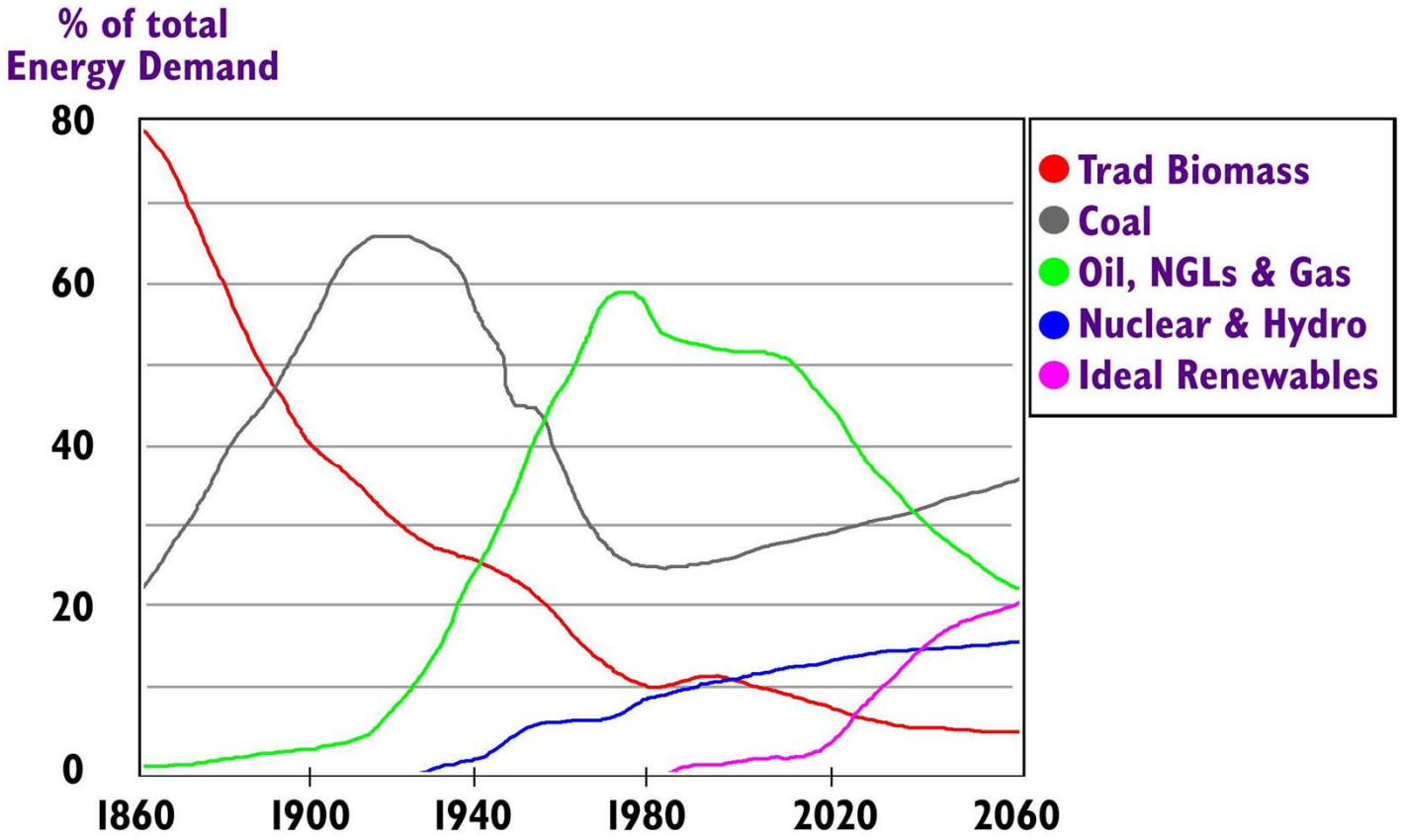
Total energy demand



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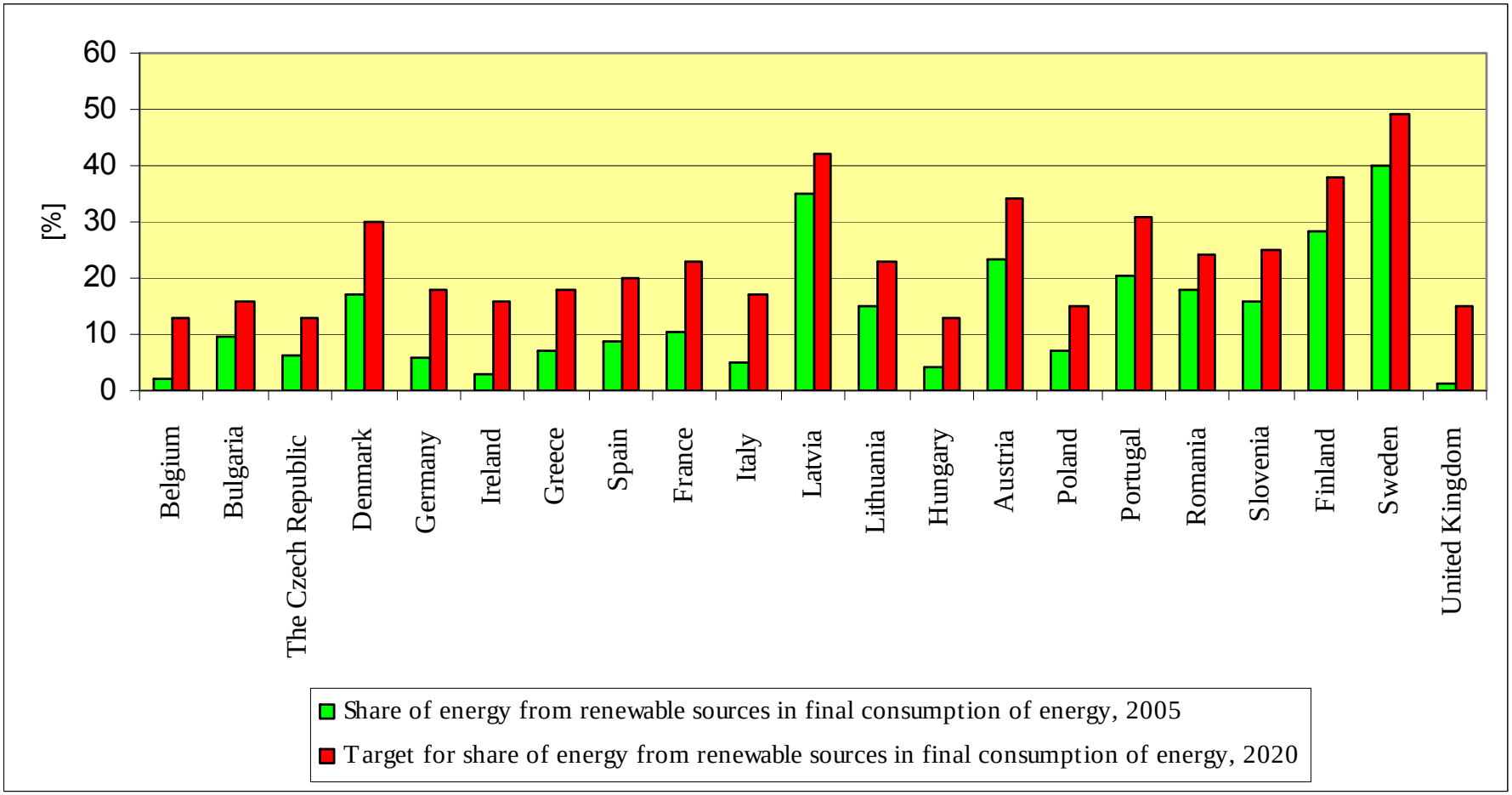
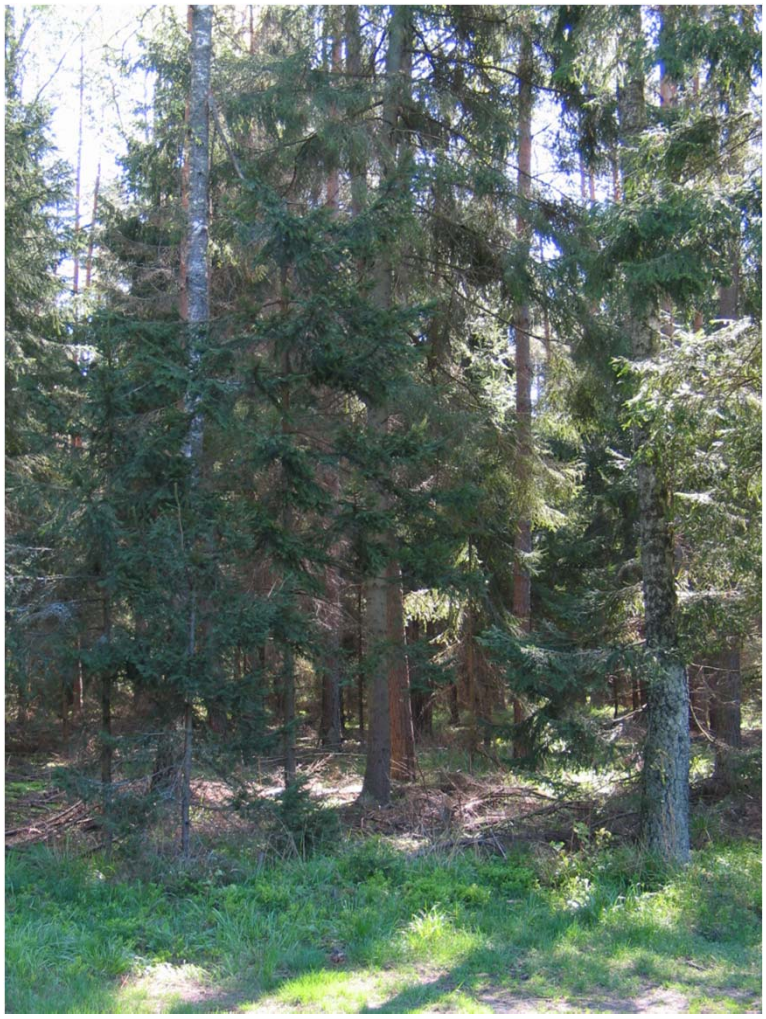
Assumed minimal share of renewable energy sources in the total production of electric energy in chosen European countries to 2020



Harvesting site (clear cut)

Harvesting site



Problems with energy wood transport

Source: Timberjack Energy Technology

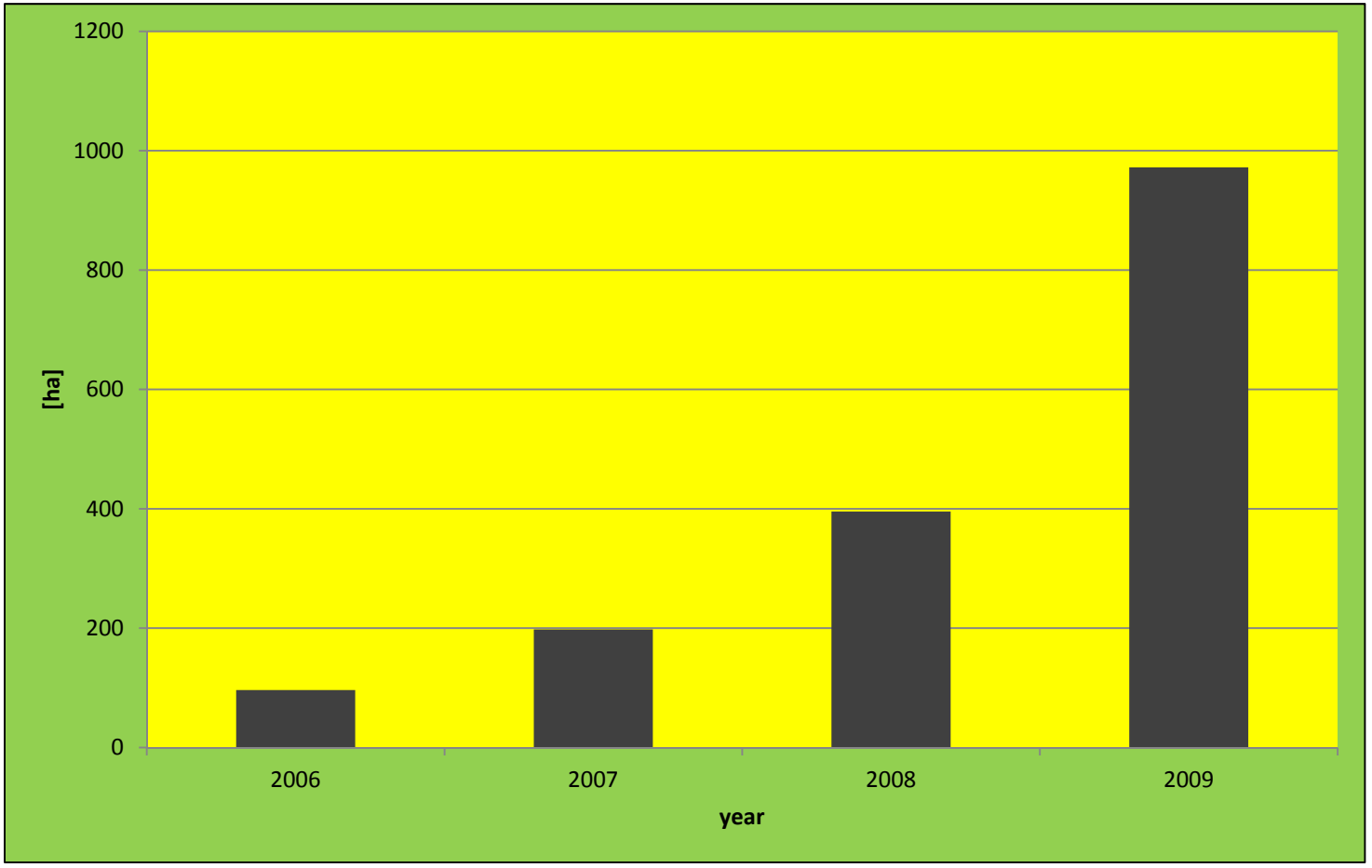
Logging residues in forests damaged by windstorm

Logging residues chipping

Logging residues chipping

Logging residues griding

Total work area of logging residues chipping in years 2006 – 2009 in the Dwukoły Forest Inspectorate



Extraction of logging residues

Chipping process

Logging residue chips dumping into a truck container

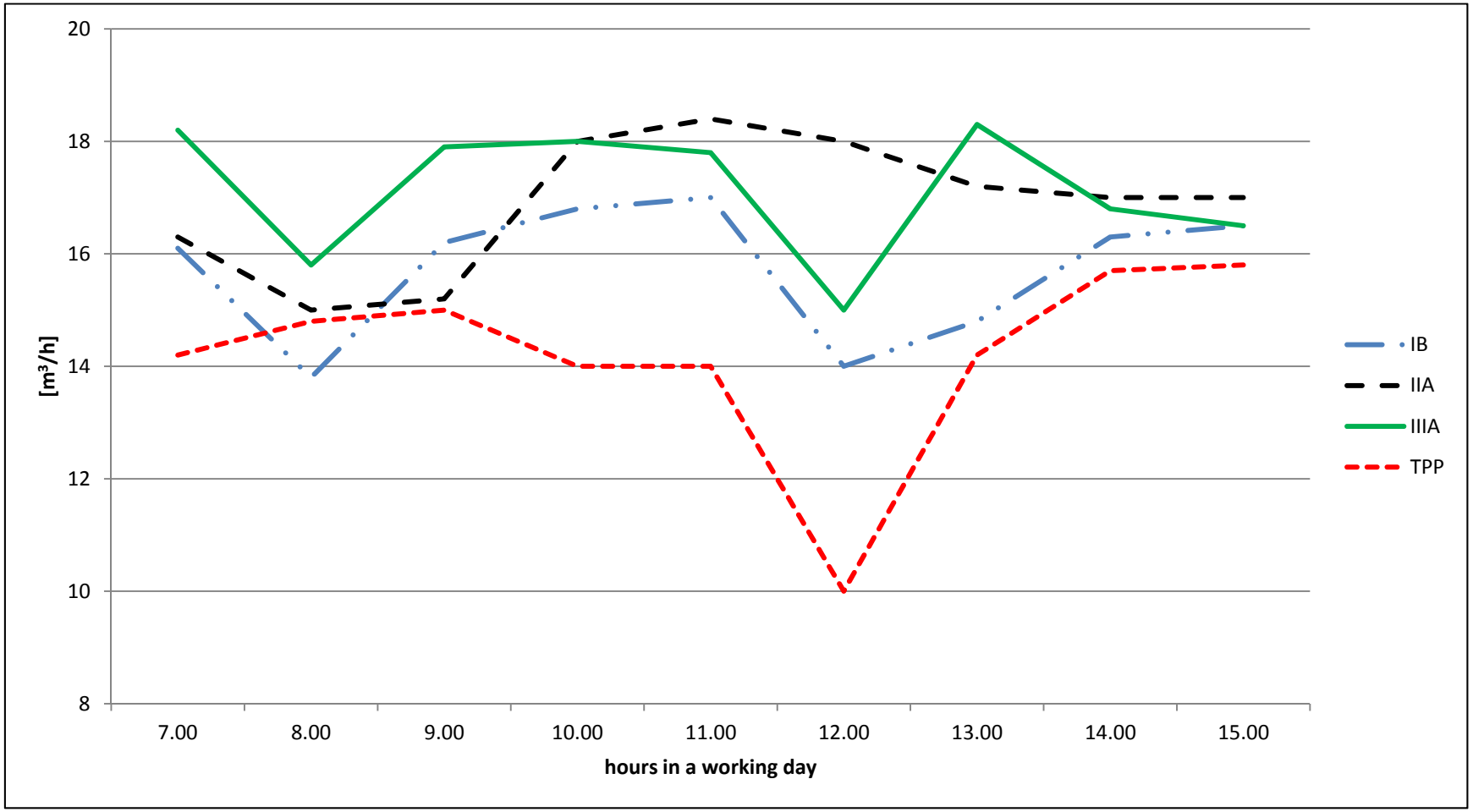
Description of research plots in the Dwukoły Forest District

	Cutting category			
	IB	IIA	IIIA	TPP
Number of forest compartment	243b	10m	94d	63a
Forest district	Łomia	Narzym	Mostowo	Mostowo
Age [years]	81	100	92	65
Types of forest	Fresh mixed coniferous forest	fresh mixed hardwood forest	Fresh mixed coniferous forest	fresh mixed hardwood forest
Forest cover	1	0,9	0,7	0,9
Stand quality class	I.5	II	II	I
Area [ha]	6.38	3.8	5.03	16.12

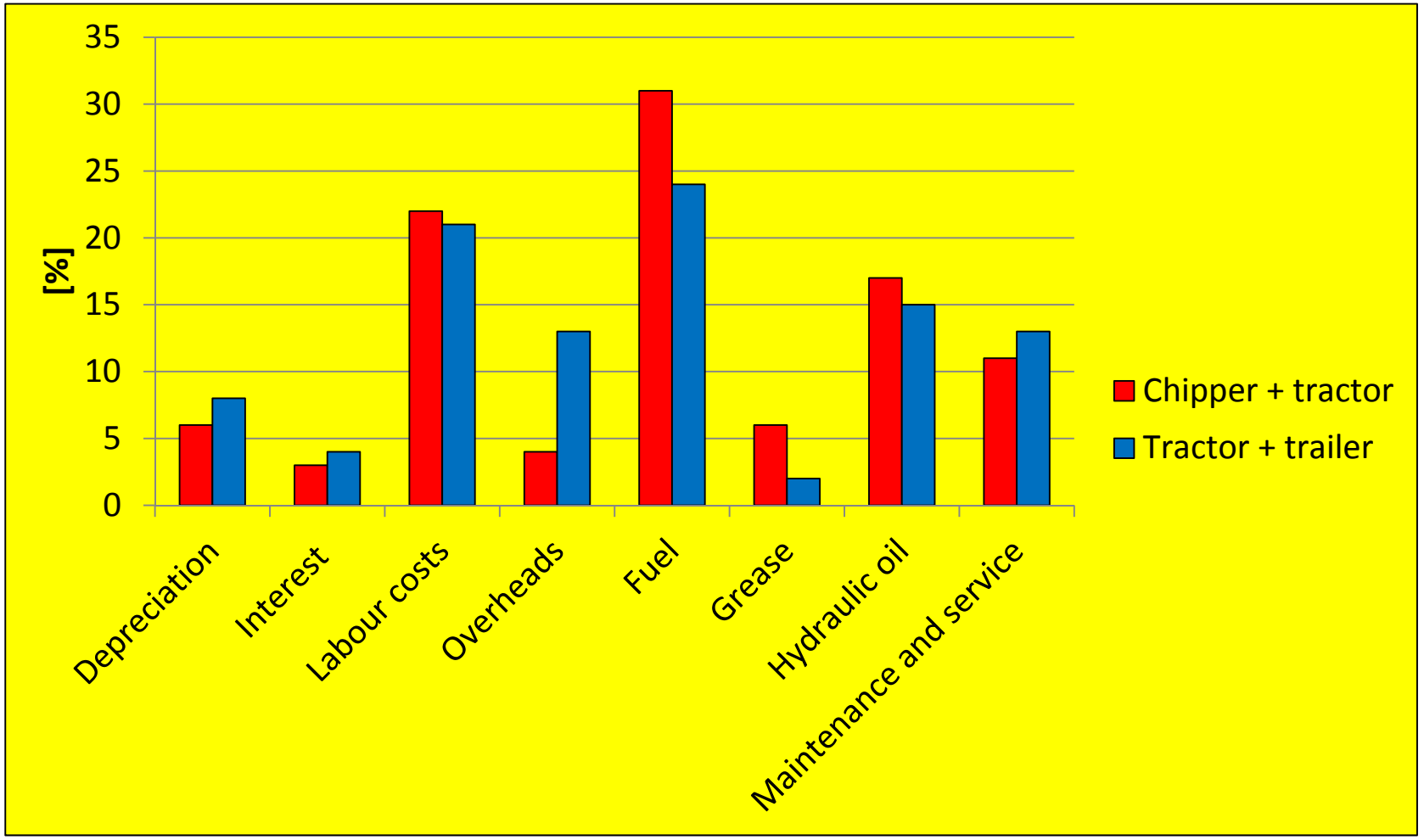
Work productivity rate of Bandit 2090 for each plot

	Chips volume (loose $m^{3)}$				Average mean value
Type of treatment	IB	IIA	IIIA	TPP	
Operational productivity	36.79	38.93	39.67	32.79	37.05
Effective productivity	38.44	40.6	40.19	35.65	38.72
	Wood volume (solid $m^{3)}$				Average mean value
Cutting category	IB	IIA	IIIA	TPP	
Operational productivity	15.82	16.74	17.06	14.1	15.93
Effective productivity	16.53	17.46	17.23	15.33	16.64

Work productivity rate of BANDIT 2090 in particular working hours



Structure of costs



Costs

- Hourly cost of use of a tractor-towed chipper – 52.30 Euro
- Hourly cost of use of a tractor with trailer – 30.91 Euro

Total cost of the machine kit cooperation – 83.21 Euro

Unit costs

- Cost of chipping of 1 m^3 of wood material – 3.30 Euro
- Cost of extraction of 1m^3 of wood material – 1.55 Euro

Cost of production of 1m^3 wood-chips (excluding transport) – 4.85 Euro

Conclusion

In the recent years, energy wood-chips have become a subject of increased interest as a source of renewable energy. The performed analysis of a scale of energy wood-chips acquisition for energy production purposes over the past four years on the example of the Dwukoły Forest Inspectorate allows us to say that desire for this type of raw material is continually increasing.

Conclusion

Average work capacity of a chipping machine amounts to 15.93 m^3/h. This number varies depending on the type of a tree-stand where the work carried out, and it oscillated within 14.1 to 17.06 m^3/h. The decisive factor in this situation, determining the changes in productivity, are tree-stand conditions and concentration and the manner of raw material placement.

Conclusion

Basic parameters determining profitability of wood chips production are high prices of the machinery, fuel, hydraulic oil and maintenance.

On the ground of the obtained price values we can firmly say that an element necessary for effective wood chips production are appropriate work organisation and preparation of raw material.