



# Improving protein value by toasting on farm

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European Advisers Training

EAT-Workshop: On-farm protein sources- cropping and feeding

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PARTNER I

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Støttet af  
Fødevareministeriet og EU

Landdistrikter.dk

Ministeriet for Fødevarer,  
Landbrug og Fiskeri

Den Europæiske  
Landbrugsfond for Udvikling  
af Landdistrikter



Commissariat de l'Agriculture, de la Pêche et de l'Alimentation

Den Europæiske Union ved Den Europæiske Fond  
for Udvikling af Landdistrikter og Ministeriet  
for Fødevarer, Landbrug og Fiskeri har deltaget  
i finansieringen af projektet.

## The AAT/PBV System

- PBV: Protein balance in the rumen tells us whether there will be enough ammonium available for the rumen bacteria with the actual level of energy available
- AAT: Amino Acids reaching the intestine thus being available for absorption

## Results from the Danish Research Center Foulum Trial with toasting 2008

- Increases AAT without affecting the total digestibility of the protein
- Reduces PBV
- The potential for increasing the AAT was better for lupins, soy beans and field beans than for peas



# AAT og PVB content- NorFor system

Gram pr. kg dm	Peas	Field beans	Lupins	Rape seed cake	Soy bean cake*
AAT 20 kg DM	103	113	98	120	216
PBV 20 kg DM	<b>92</b>	142	218	156	203
MJ NE 20 kg DM	8,38	8,25	8,13	7,8	9,0

\* Toasted

# Effect of toasting

	Field beans untreated.	Field beans toasted	Lupins untreated.	Lupins toasted
AAT gram/kg dm	112 →	143	98 →	171
PBV gram/kg dm	142 →	107	218 →	136

## Effect of toasting

- Increase in AAT
- Reduce PBV

# Case study of 3 organic dairy farms substituting bough-in concentrate with toasted lupins/field beans

- Cost reduced by 13-40 cent pr. day of the ration
- Less reduction of the ration cost in summer rations
- Less reduction with dried grass/alfalfa pellets in the ration
- Less need to use toasting in rations with dried grass/alfalfa pellets
- PBV is increased and fat content is reduced
- If the fat level should not be reduced then other fat sources is needed and the cost reduction might disappear

# Farm toaster tested in 2012



**Dilts-Wetzel Soybean Roaster**

VFL Kvæg, Økologi & Agrotech A/S



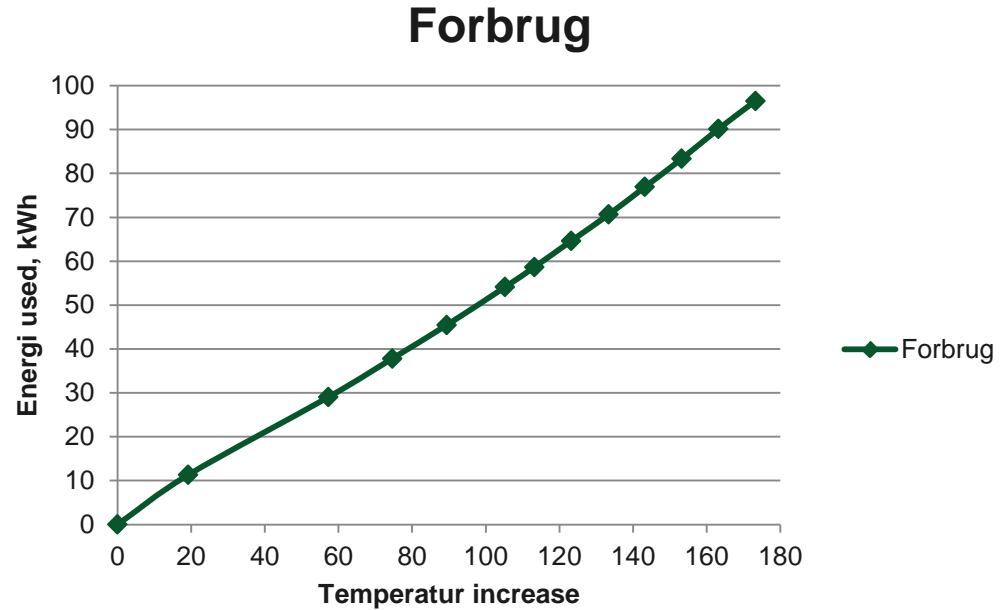




# Energy forbrug

## Heating up:

80-100 kWh for the oil to reach temp. of 160-180 °C



7,50 euro for each time the toaster is switched on (10,67 cent/kWh)

## Running it:

17-18 kWh pr. hour

# Capacity

- 2,2-2,3 ton pr. 24 hours (3 ton/24 hours)

# Economy

<b><u>Generel</u></b>			
Capacity	2,0	tons pr. 24 hrs	
Hektar with field beans	40,0	ha	
Yield	5.000,0	kg pr. ha	
Hestebønnes massefylde	830,0	kg pr kbm	
Mængde med hestebønne	241,0	kbm	
Tons field beans	200,0	ton	2.000,0

# Economy

<b><u>Investment TOASTER</u></b>		
Price, euro	24.667	euro
lifespan, years.	15	years
Value loss	0,14	%
interest	0,05	
Afskrivning' loss of value(?)	1.473	
S-værdi	2.568	
Forrentning (interest..?)	784	
Total cost pr. year	2.257	euro pr år
Total cost pr. ton	11,29	euro pr. ton

# Economy

<b><u>Energy consumption</u></b>			
<b><i>Starting up</i></b>			
amount of kWh	4,4	pr. 10 C the oil is heated	
Price pr. kWh	0,107	Euro pr kWh	
Strømforbrug ved opstart - euro	7,5328	Euro	
Strømforbrug ved opstart - ton	0,04	Euro pr. ton	
<b><i>running</i></b>			
energy consumption	0,2925	kWh pr minut	
Kg field beans processed	2,57	kg pr minut	
Strømforbrug ved drift	<b>0,11</b>	kWh pr. kg	
Udgift ved drift	0,016	euro. pr. kg	
Udgift ved drift	16,00	euro pr. ton	
<b><i>Total cost energy</i></b>			
	16,04	euro pr. ton	

# Economy

<b><u>Maintainance</u></b>			
liter olie - 10 % of content in the t	40	liter olie	10 % af olien
Price	0,8267	euro pr. liter	
cost of oil pr. år	33,068	Euro pr. år	
Cost of oil pr. ton	0,2	Euro pr. ton	
Maintainance	0,005	promille af investeringssumme	
Maintainance incl. own work	0,123335	Euro pr. hr	
amount of hours used pr. year	2.400	timer pr. year	
Cost pr år	296	Euro. pr. year	
Cost pr ton	1,48002	Euro pr. ton	
Total	1,6	Euro pr. ton	

# Economy

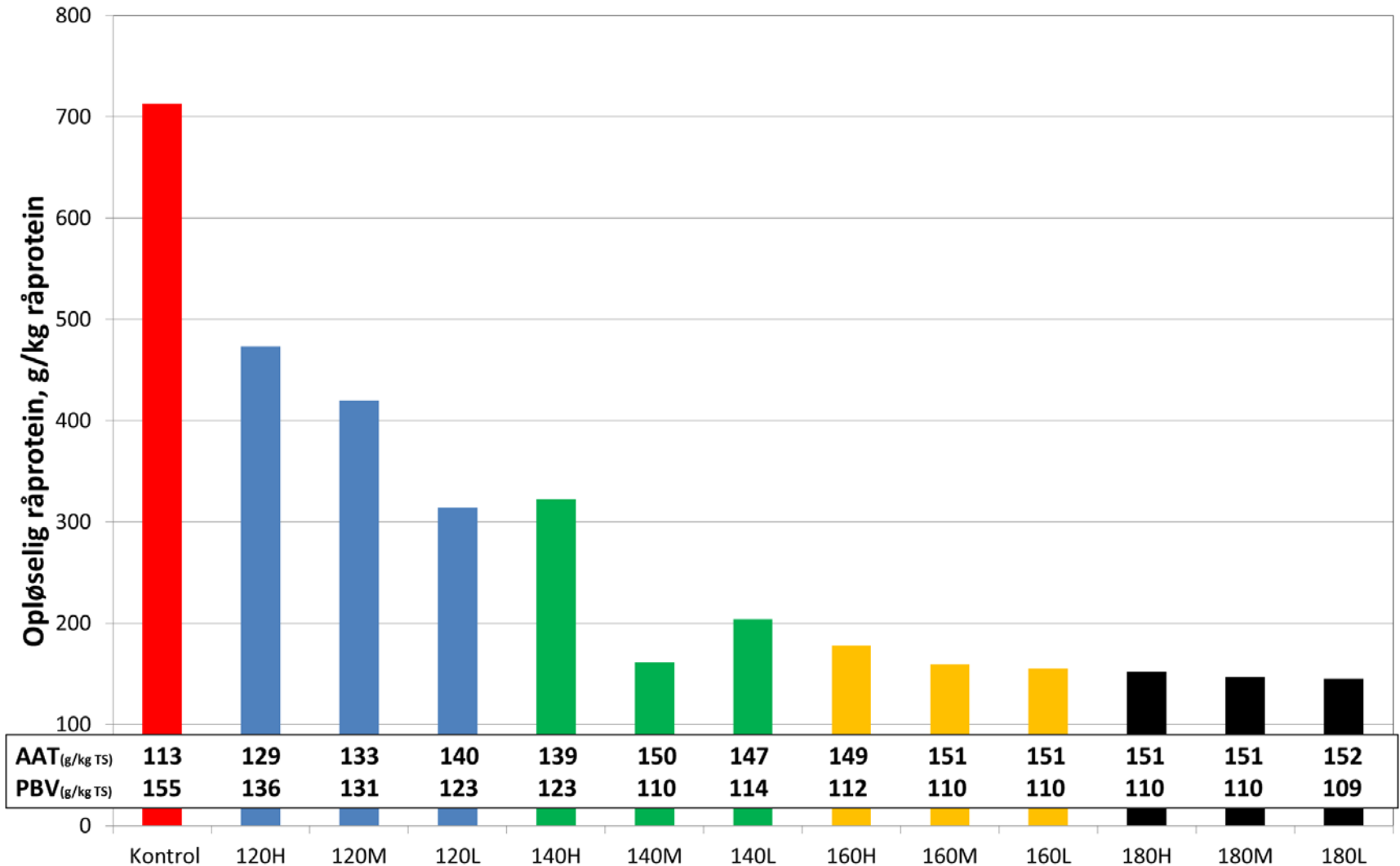
<b><u>Time used for cleaning</u></b>		
Wages	24,9	kr. pr. time
Amount of time	5,0	min pr døgn
Price	2,08	euro pr. 24 h
Price pr ton	1,04	Euro pr. ton
<b><u>Loading from storage to toaster - pr 24 hrs</u></b>		
En skovl tager	2,0	kbm
Antal skovle pr døgn	0,0	
estimated time spent on loading	10,0	min
Cost traktor w/ frontloader (FTO)	73,3	Euro pr. time
Price	12,22	Euro pr. 24 hr
Price pr ton	6,11	Euro pr. ton
<b>Estimated time used for 'emptyin</b>	<b>5,00</b>	<b>minutter</b>
Cost traktor w/ frontloader (FTO)	73,3	Euro pr. time
Price	6,11	Euro pr. døgn
Price pr. ton	3,06	Euro pr. ton



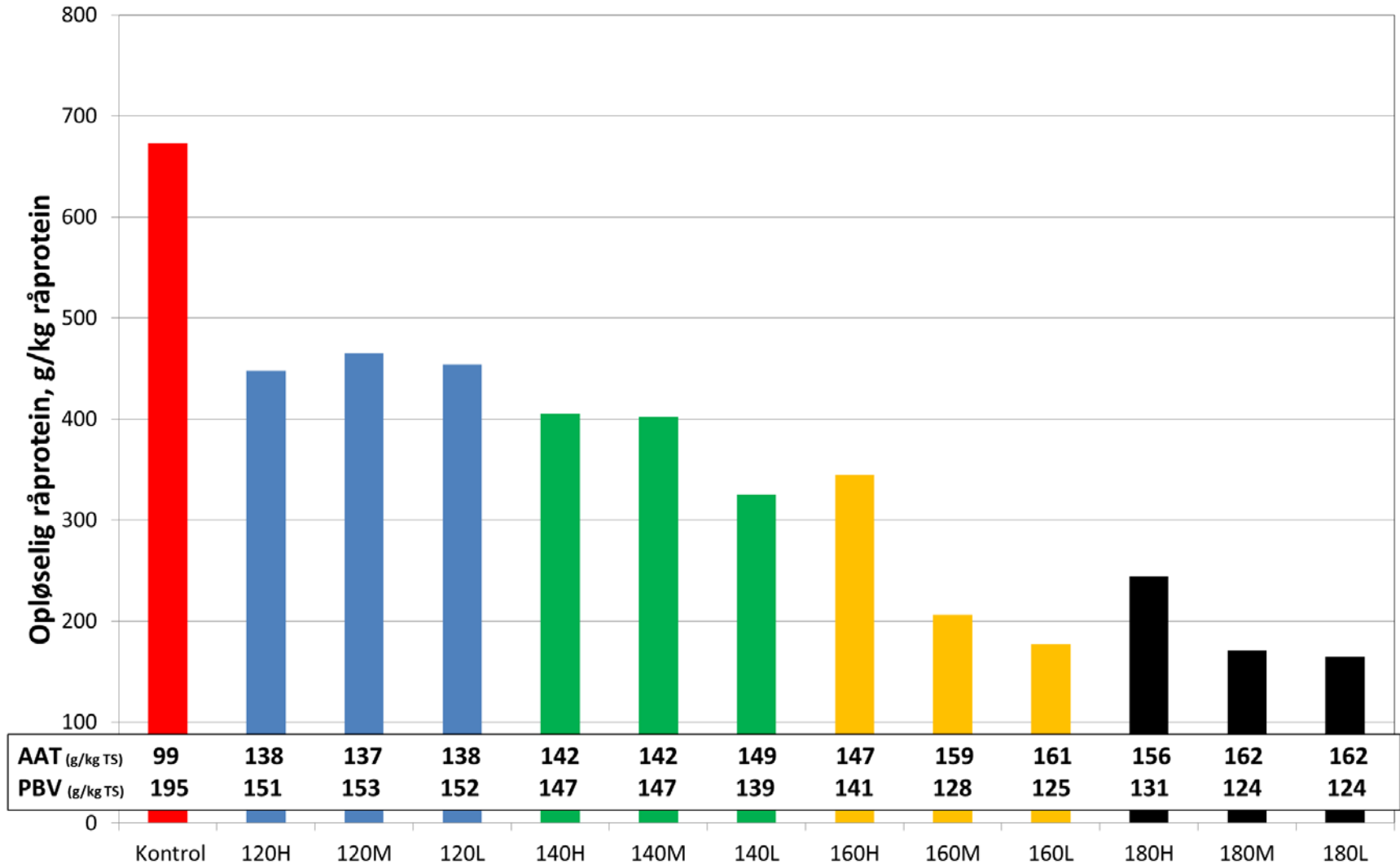
# Economy

<b>Total cost pr ton</b>	<b>39,21 Euro</b>			<b>3,92 euro pr. kg</b>	
<b>Total cost pr. year</b>	<b>7.843 Euro</b>				

## Hestebønner: Effekt af forskellig temperatur og hastighed



## Lupin: Effekt af forskellig temperatur og hastighed



<b>Udfodring pr. dyr pr. dag</b>	<b>øre/kg</b>			<b>Basisration</b>	<b>Alternativ til basisration</b>	<b>Optimeret ration ubeh. HB</b>	<b>Optimeret ration toastet HB</b>
Vårbyg	270		Kg	6	5,8	6,0	6,0
Sojabønner, Toasted	480		Kg	2,8	2,0	2,9	1,9
Lupin, gul (skøn)	225		Kg	0,2			
Hestebønner	284		Kg	0,7		2,5	
Hestebønner toasted	322		Kg		2,0		3,1
Roemelasse	615		Kg	0,5	0,5	0,5	0,5
3+4 sl. gras	25,1		Kg	14,5	14,5	14,5	14,5
Majs 2011	22,5		Kg	10,0	10,0	10,0	10,0
Grønpiller, Ekstra	165		Kg	0,5	0,5	0,5	0,5

Udfodring pr. dyr pr. dag	øre/k g	Basisration		Alternativ til basisration	Optimeret ration ubeh. HB	Optimeret ration toastet HB	
Næringsstofindhold		MIN	MAX				
Foderoptagelse	kg TS/dag			19,3	19,4	20,7	20,4
Energi	MJ/kgts			6,57	6,55	6,62	6,58
Energibalance	%			99,6	99,6	107,6	105,5
<b>AAT</b>	<b>g/MJ</b>	<b>15</b>		<b>15,1</b>	<b>15,3</b>	<b>16,8</b>	<b>16,8</b>
<b>PBV</b>	<b>g/kg TS</b>	<b>10</b>	<b>40</b>	<b>22</b>	<b>21</b>	<b>28</b>	<b>23</b>
<b>Fedtsyrer</b>	<b>g/kg TS</b>	<b># 30</b>	<b>40</b>	<b>39</b>	<b>32</b>	<b>38</b>	<b>30</b>
NDF	g/kg TS			289	288	279	281
Vombelastning				0,59	0,62	0,64	0,65
Sukker	g/kg TS			51	49	49	48
Stivelse	g/kg TS			235	250	252	262
Fylde i alt	FV	<b>7,20</b>	<b>7,43</b>	6,89	6,92	7,2	7,16
Grovfoder %, økol.	% af TS			54,5	54,3	50,8	51,5
Forventet EKM-ydels	kg/dag			30,7	30,7	34,0	33,1
<b>Pris</b>	<b>kr/dag</b>			<b>42,81</b>	<b>42,43</b>	<b>47,75</b>	<b>46,12</b>
<b>Prisforskel</b>	<b>kr/dag</b>				<b>0,38</b>		<b>1,63</b>



Fonden for Økologisk Landbrug og et Europæiske Fællesskab ved Den Europæiske Fond for Udvikling af Landdistrikter og Ministeriet for Fødevarer, Landbrug og Fiskeri har deltaget i finansieringen af projektet.