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"Enhancing health benefits of cereal foods - results, perspectives and challenges"

"New consumer product prototypes"

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Summary

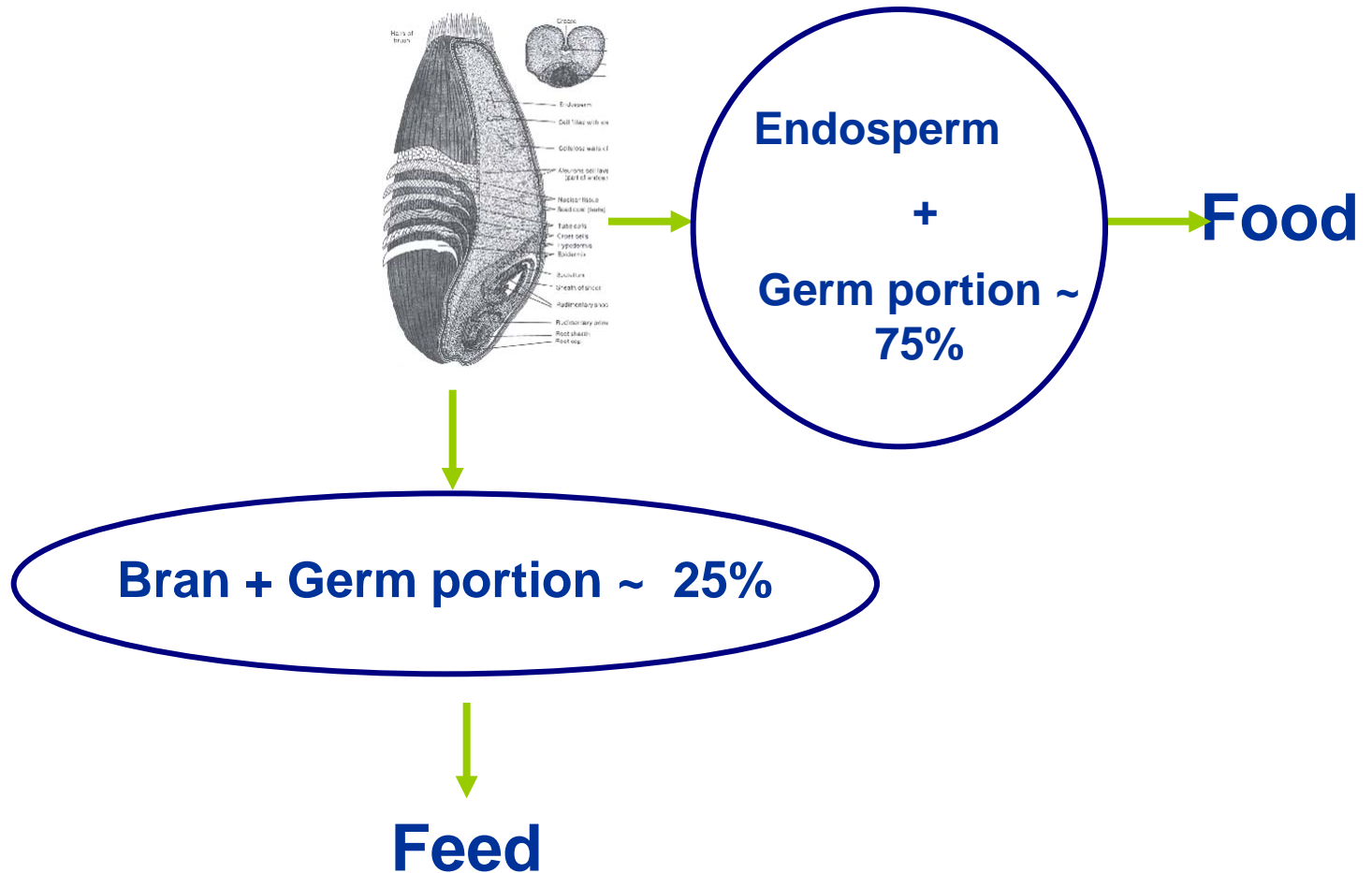
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- **HealthGrain Fractionation Model**
- **HealthFlour and derived end products**
- **Perspectives**



Current Main Use

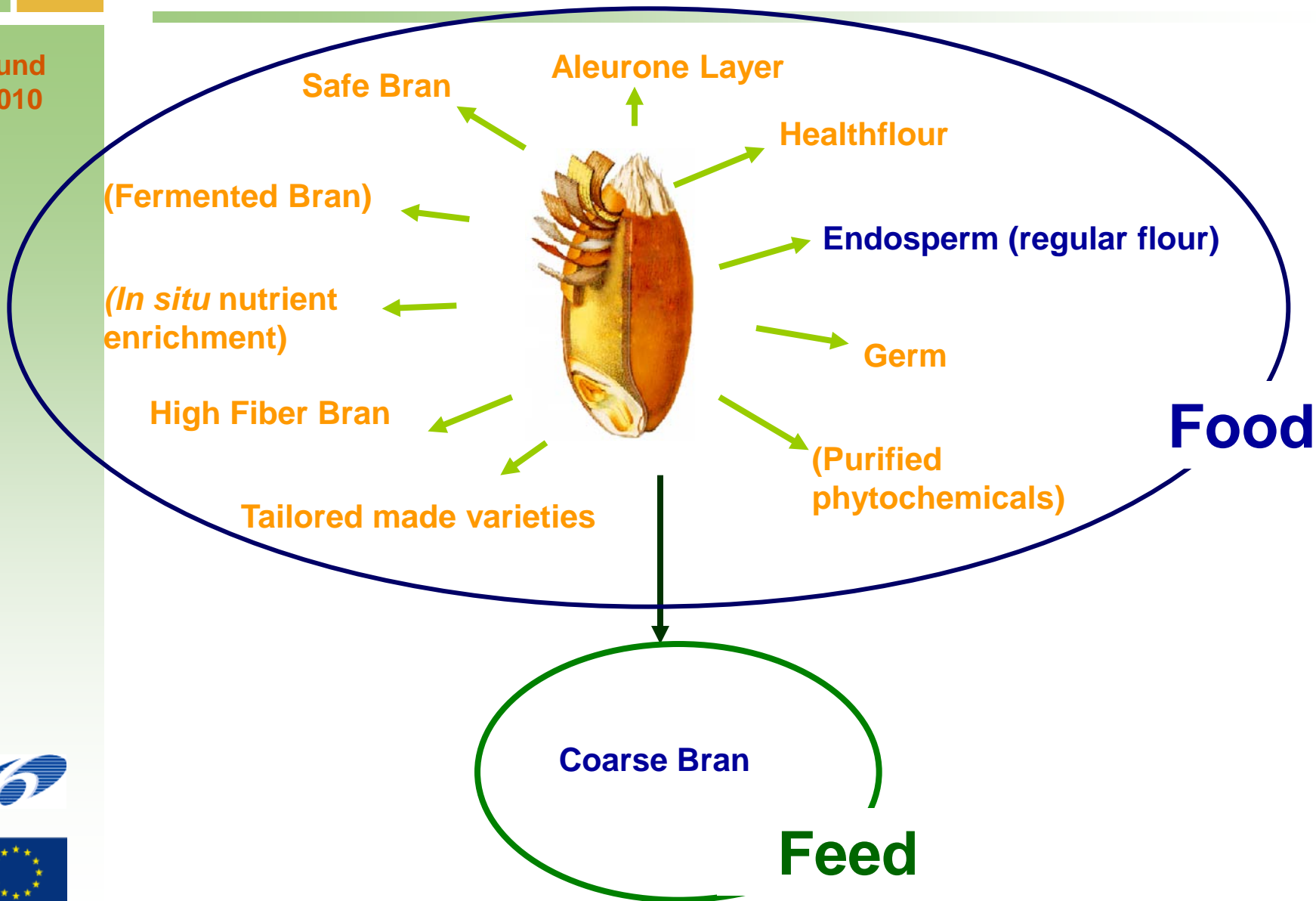
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HealthGrain kernel fractionation model

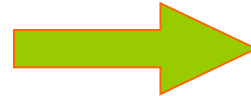
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Product Design Drivers

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- **Nutrition**
- **Taste**
- **Texture**
- **Aspect**
- **Safety**
- **Costs**



*Increase
consumption of
healthier grain
based end
products*



Two concept examples

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Inner bran fraction



Food Safety Improved

Better Taste and Nutrition

- Antioxidant activity;
- Without cardboard-like off notes.

Bran after peeling



Attractive Aspect and Nutrition

- Higher fiber content;
- Lighter background color;
- Better bread volume

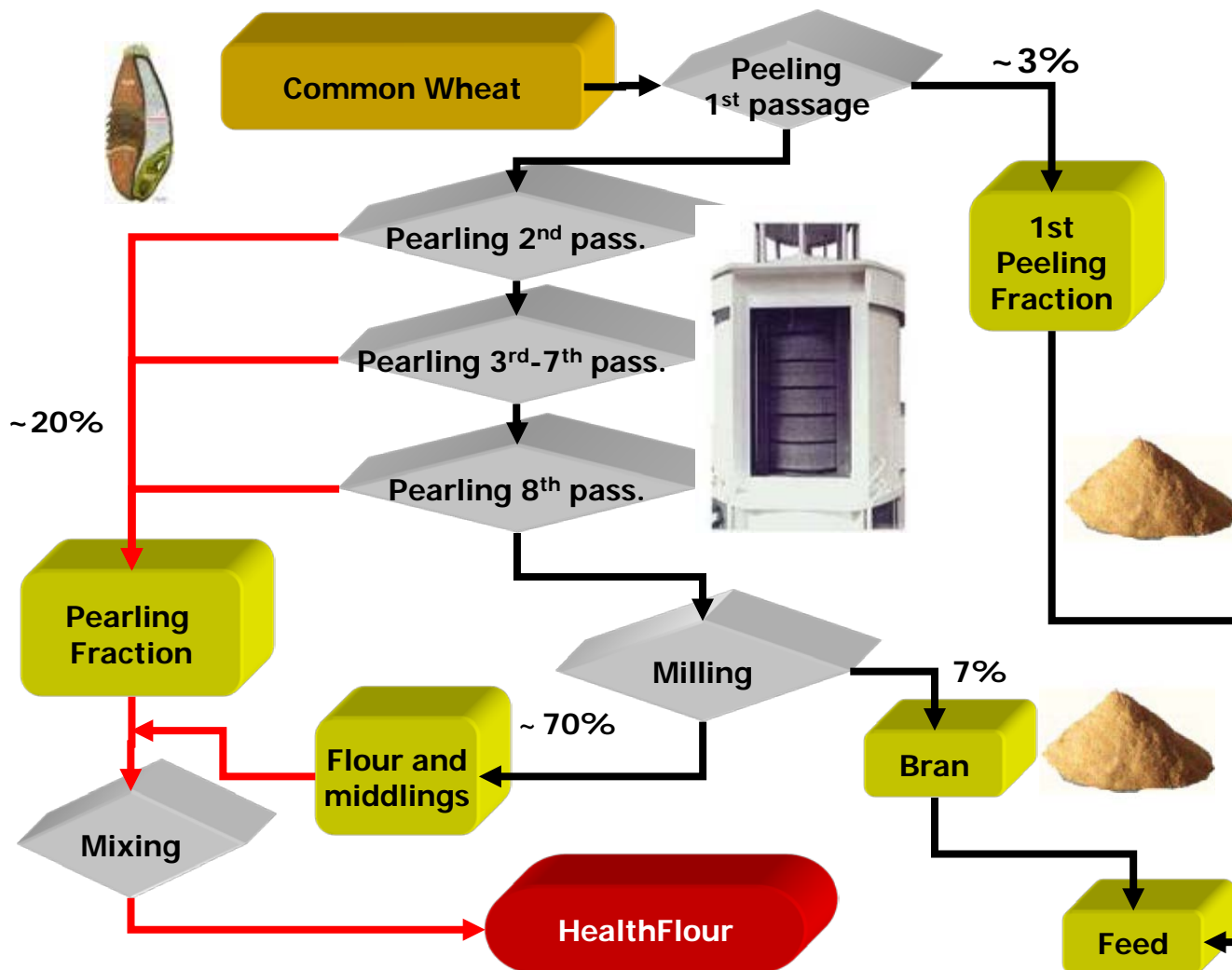


Many combinations can be made to reach other consumer needs



Flour from peeled kernels with crease removed: "Healthflour"

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Industrial Pearling Machine

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Screen



Abrasive stones



What is Healthflour ?

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Healthflour

(yield 93,5%)

		Yield (%)	TDF (%dm)	Ash (%dm)	Protein (%dm)
	Wheat		13,25	1,59	14,50
Debranning	bran from 1st Pass.	2,7	57,00	3,73	13,58
	bran from 2nd Pass.	3,2	44,35	4,19	17,90
	bran from 3rd Pass.	3,4	29,22	3,83	19,54
	bran from 4th Pass.	3,5	23,85	3,55	19,64
	bran from 5th Pass.	3,5	20,29	3,35	19,11
	bran from 6th Pass.	3,5	18,95	3,09	18,46
	bran from 7th Pass.	3,1	17,82	2,89	18,24
	bran from 8th Pass.	2,8	15,50	2,63	17,68
Milling	Flour	64,0	2,8	0,55	12,75
	Fine Middling	2,6	12,0	1,2	14,5
	Red Dog	3,9	22,4	3,8	16,1
	Bran	3,9	52,0	6,1	17,5

Fiber
(%dm)

9,2

Ash
(%dm)

1,4

Protein
(%dm)

14,4



HF investment and production cost

Hypothesis: Conversion of a regular mill with 15t/h capability in a HF production mill with a final capacity of 18t/h

HF production = 110.000t/y

Flour yield = 94%

Investment	k€	€/t
Total investment	1440	
Depreciation charge (5 years)		2.3
Maintenance		0.23
Energy		7.38
Higher cost of HF vs. regular whole wheat flour		9.91

Flours /

Characteristics

Ingredients	TDF %dm	Insoluble % dm	Soluble % dm	AX %dm	Ferulic Acid *	Phytate % dm	α- toco-ph. (Vit. E)*	Vit B1*	Vit B3*	Vit B9*	Fe*	Mg*	Mn*	P*	Ca*
Whole Grain Flour (Wheat)	11- 14	10-12	1-2	6.9	1	0.12	0.07	0.3- 0.5	2-4	0.03	3.4 - 4.0	130- 140	2-4	300- 400	20- 30
HealthFlour (Wheat)	9	8	1	5.4	1	0.1	0.04	0.3 6	2.7	0.03	3.4	130	2.7	315	22
Flour (Wheat)	2-3	1.5-2	0.5-1	1-2	0.1	0.04	0.02	0.1- 0.2	1-2	0.02	0.5- 1.5	20- 50	0.5	100- 200	10- 20
Aleurone	47- 55	43-50	3-4	24- 34	7.8- 8.5	1.1	0.01	1.0- 1.3	28- 33	0.1	20- 26	600- 900	80- 120	1500 - 2200	70- 90
AXOS (arabinoxylan- oligosaccharides)			85												
Germ	18- 20	15-18	2-2.5	11. 5	40- 60	0.2	0.15	1.0- 2.5	3-7	0.02	9- 10	200- 250	70- 120	900- 1100	50- 70
Oat	11- 23	7-12	5-11	2.6	6.0- 7.8	0.6	0.07	0.7	0.9	0.05	1.3	180	5	520	54
Barley	15- 24	7-13	6-10	3.1	1.2- 5.4	0.5	0.07	0.6	4.6	0.02	0.7	133	1.9	120	14
Rye	13. 7	9-11	9-11	8.9	1.3	1.3	0.07	0.3	4.2	0.04	0.26	110	2.6	374	33

* = mg/100g.

Source: Healthgrain database; INRAN database; Barilla G. e R. Fratelli R&D

Flour +

Enriched flours: estimated contribution in Bread Prototypes

Ingredients	TDF %dm	Soluble %dm	AX %dm	Ferulic Acid**	Phytate %dm	α-tocop (Vit. E)**	Vit B1**	Vit B3**	Vit B9**	Fe**	Mg**	Mn**	P**	Ca**
Health Flour	4.5	0.5	2.7	0.5	0.5	0.02	0.18	1.35	0.013	1.7	65	1.35	158	11
HF + Aleurone (10%)	6.3	0.7	4.2	0.9	1	0.02	0.2 12.5*	2.9 16*	0.028 1.4*	2.9 20*	103 34*	6.5 70*	250 31.5*	15.3
HF + AXOS (5%)	6.9	2.4	2.7	0.4	0.4	0.018	0.17 12.5*	1.3 7.5*	0.012 0.7*	1.6 12*	62 21.5*	1.3 13.5*	150 20*	10
HF + Germ (5%)	5	0.6	3	1.7	0.5	0.06 6*	0.22 16*	1.5 8*	0.019 0.9*	1.9 14*	70 23*	3.9 39*	185 22.5*	12.5
Whole Grain Flour (Wheat)	6	0.5	3.5	0.5	0.6	0.03 3.5*	0.2 14*	1.5 8*	0.015 0.7*	1.7 12*	75 22.5*	1.5 15*	175 22*	12.5
Wheat Flour	1.3	0.35	0.6	0.05	0.1	0.01	0.07	0.75	0.008	0.6	18	0.25	75	7.5


 * = % RDA on 100g; ** = mg/100g

Enriched Healthflour vs Regular Whole Grain Bread

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<i>Enriched Healthflour Prototype</i>	Bread Characteristics				
	Safety	Nutrition	Texture	Taste	Aspect
Healthflour	+	=	=	+	+
HF + Aleurone	+	+	-	+	-
HF + AXOS	+	+	=	+	+
HF + Germ	+	+	=	+	+





Product prototypes (I)

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White bread



Healthflour bread



HEALTHFLOUR
(Wheat)



WHOLE Grain Flour
(Wheat)



Biscuits



TDF: 4%

TDF: 8,5%



AXOS





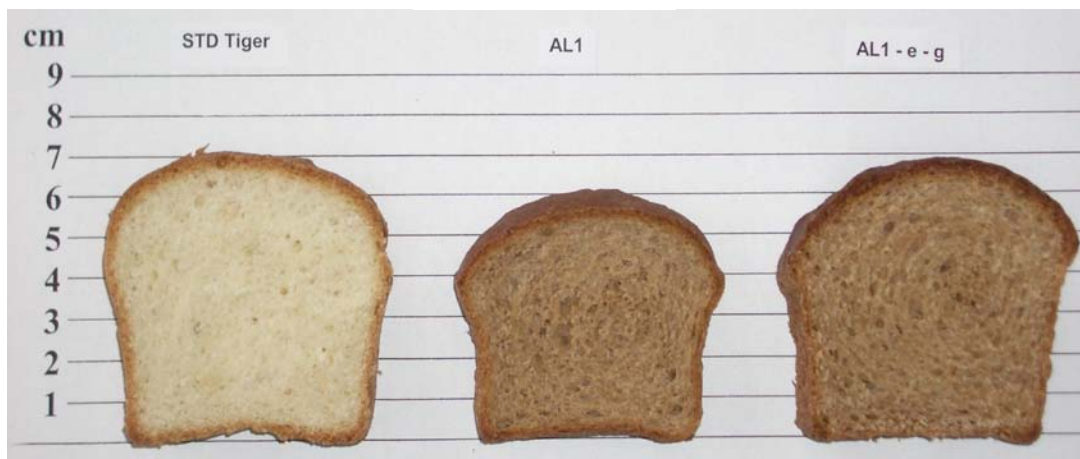
Product Prototypes (II)

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WHITE

W + Aleurone

W + Aleurone + Gluten

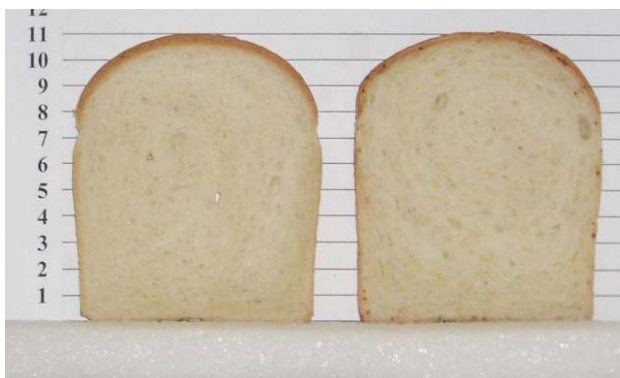


WHITE

W + Germ

WHITE

W + Germ



Perspectives

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- **It is possible to offer good and health end products using relevant fractions of bran and/or other kernel portions.**
- **From whole grain lovers to all consumers. Shelves will be populated by grain based end products tailored-made to better meet the consumer needs.**
- **Fair competition in food innovation and definition of a clear regulatory framework and harmonization in EU.**





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***Thanks
for your attention***



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