

# The Science of Success



# Keenan Mech-fiber and Sustainable Food Production

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Chairman, Keenan Scientific Advisory Board



# Agri-food System Challenges

- Population growth and increasing food production
- Efficient food production
- Technological innovation
- Environmental stewardship
- Economic and social sustainability





# Keenan Mech-fiber

- Breakthrough technology
- Increase profitability
- Improves animal health and welfare
- Positive environmental impacts
- Strengthens sustainability



# The Science of Success



# The Mech-fiber Breakthrough

**Professor Jim Drackley** - University of Illinois

**Professor David Beever** - Keenan  
International Nutrition Director





# The Mech-fiber Breakthrough

**Getting more production from less feed**

- 20 - 30% greater Feed Efficiency
- Not through ration change, but through manipulation of 'physical' ration
- Optimising rumen function to get more from feeds
- Strong Science and proven field results



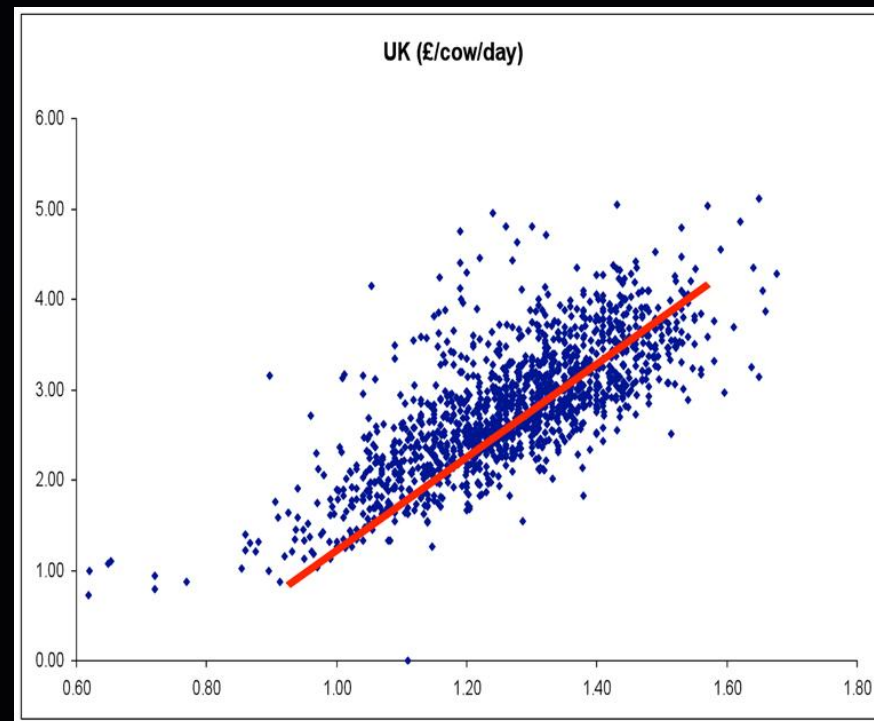
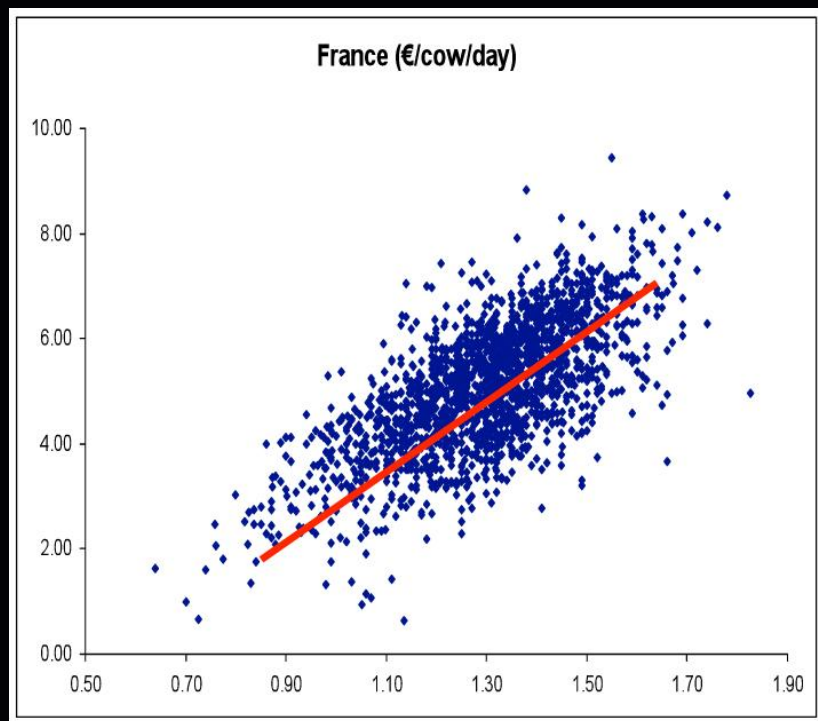
# The story begins: Professor Colman Study 2008

- 500 Keenan users in UK and France
- €260 Gain in France in 12 months and £90/cow gain in UK in 12 months
- + 2.5 litres from 1kg less feed
- Feed Efficiency Improvement of 15%





# Mech-fiber Science: Professor Colman Study 2008 Feed Conversion Efficiency (FCE):



Prof. David Colman, Manchester University

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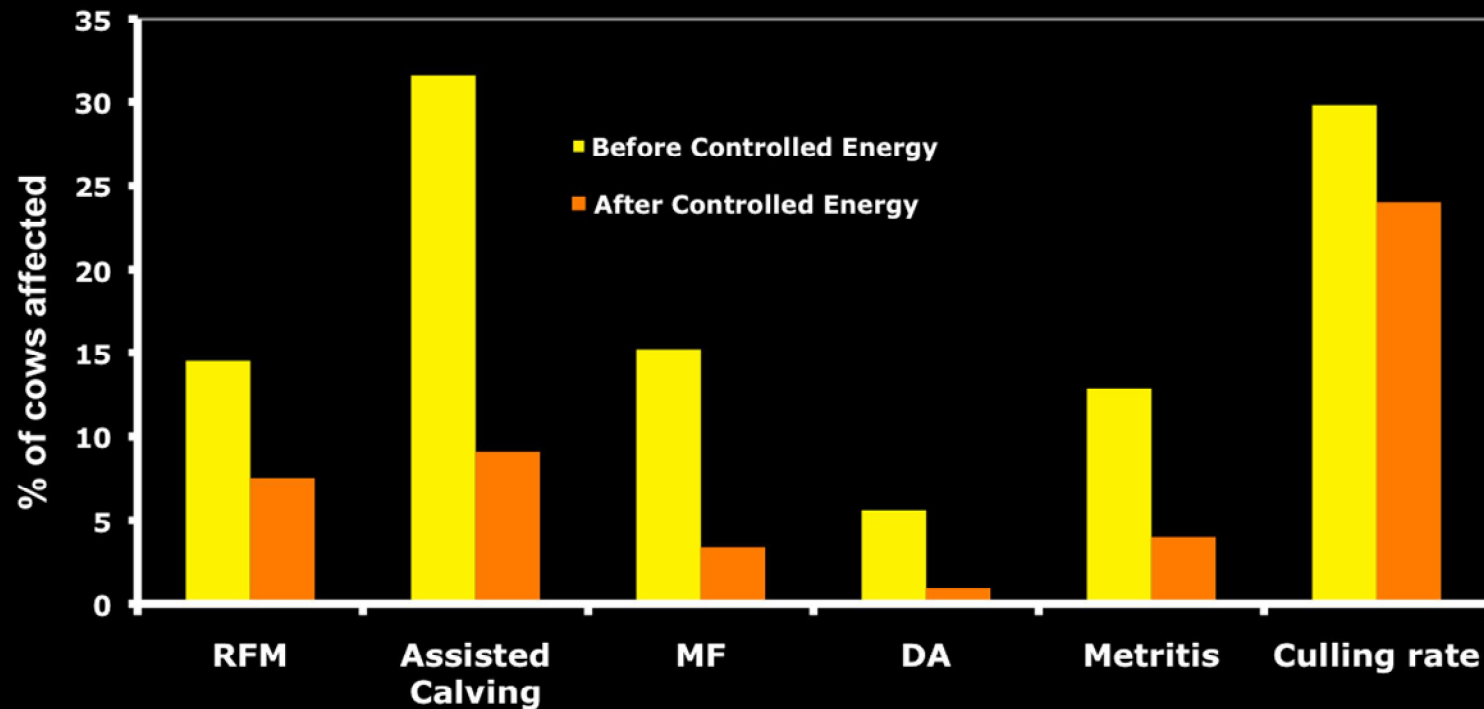
# Mech-fiber Science: University of Illinois 2008

**Substantial gains also seen in  
animal health:**

- More consistent intakes
- Less fluctuation in body condition
- Increased lactational persistency
- Less liver fat accumulation



# Mech-fiber Science: France: Animal health benefits



69% reduction due to nutrition

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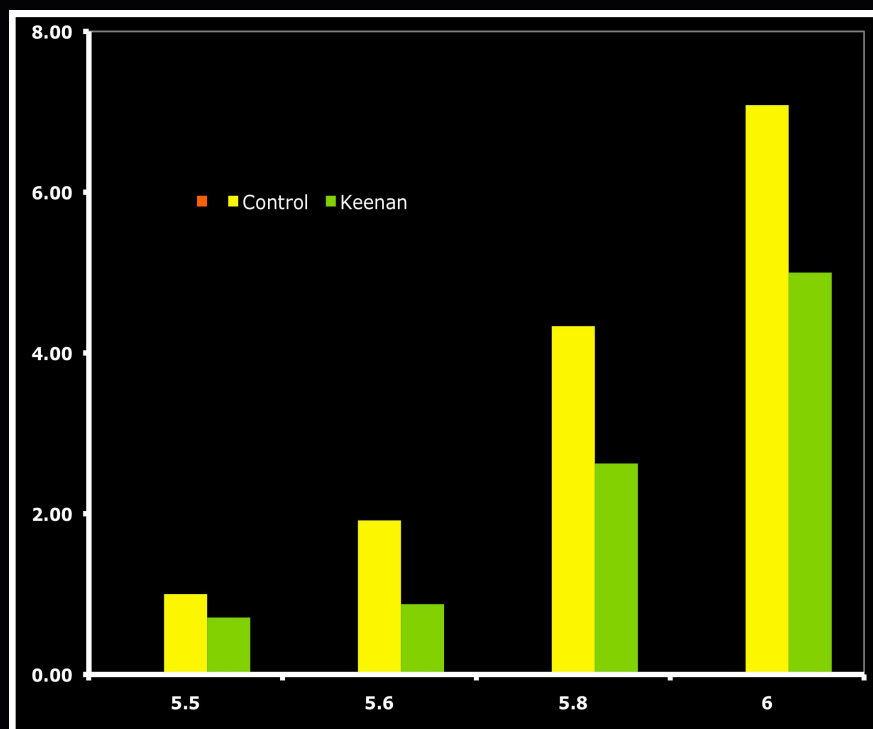
# Mech-fiber Science: University of Reading 2008

**Definite and statistically quantifiable  
machine effect in the physical  
presentation of identical rations**

An extra one litre of milk production/day,  
0.06% extra milk protein content and an  
extra 45g/cow/day of milk protein (as  
casein) when comparing a ration mixed  
in a Keenan with the identical ration  
mixed in a vertical auger mixer.



# Mech-fiber Science: UNIVERSITY OF READING 2008



## Rumen hours below pH 6.0

Rumen conditions were more stable with the Keenan mixed ration - the time in which the rumen was considered to be significantly acidic (less than pH 6.0) was reduced by 33%.

# What did we know before the discovery?

## We knew about...

- Diet formulation
- Particle length and specific gravity are important
- Need for sufficient 'physically effective fiber'
- Knowledge of poor mixing and its effect in 'disabling' rations





# The Breakthrough

What is NEW is the discovery of two important principles:

1. The effect bulk density of the ration, uniformity of particle size distribution, physical structure and 'architecture' of the fibre particles has on the physical consistency of the resulting rumen contents and the impact this has on the cow's ability to utilise the ration more efficiently for milk production.

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# The Breakthrough

What is NEW is the discovery of two important principles:

2. The knowledge of how to practically manipulate physical ration structure - the science of 'Physical Nutrition' - to optimise Feed Conversion Efficiency.

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**Think of a cow as a car!**



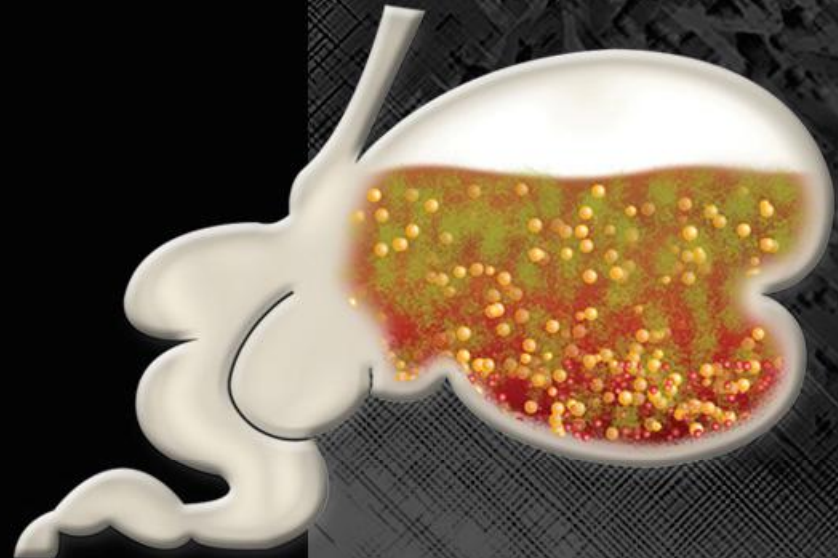


# The conventionally fed rumen



## Too much short fibre

Dense layers or mats of fibre congesting the rumen and slowing rumen function. Nutrients pass through undigested.



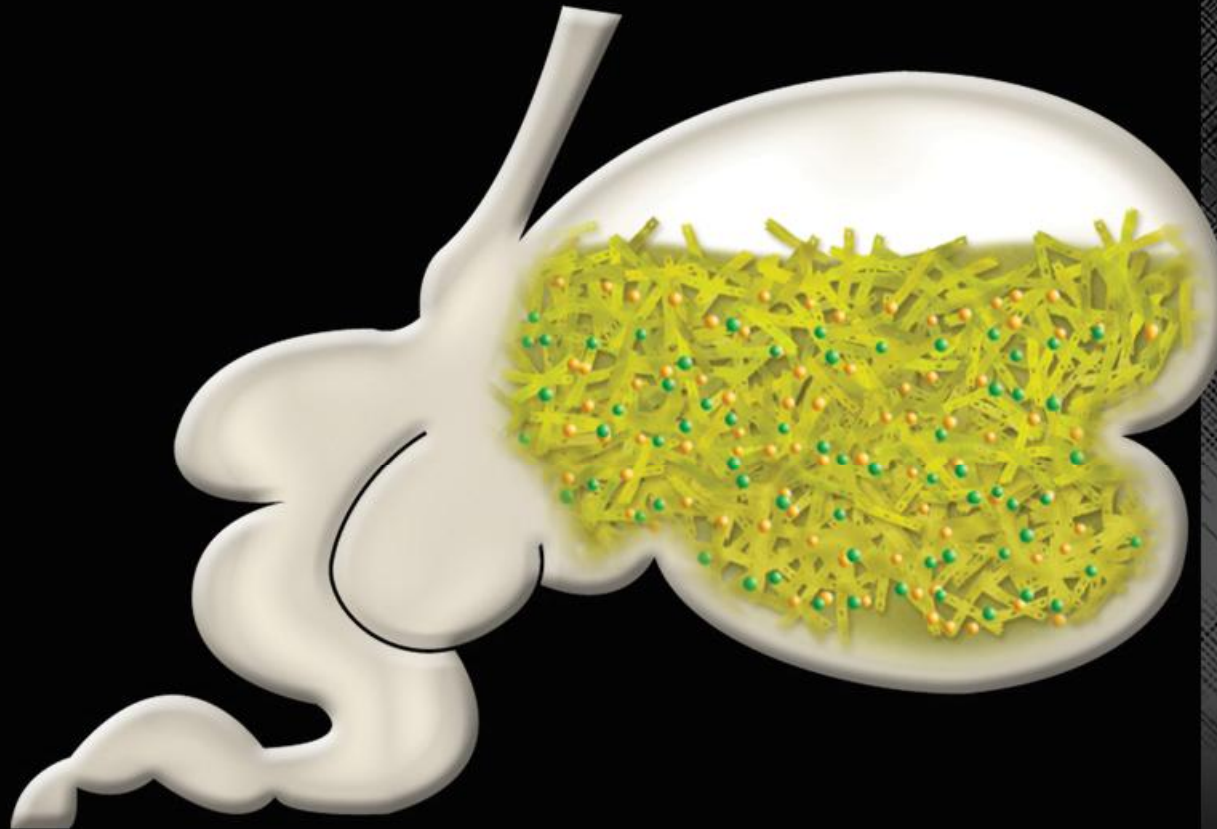
## Too many small particles

Enzymes and microflora in overdrive producing acidosis and health problems. Poor fibre digestion and loss of nutrients.

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# The Mech-fiber rumen

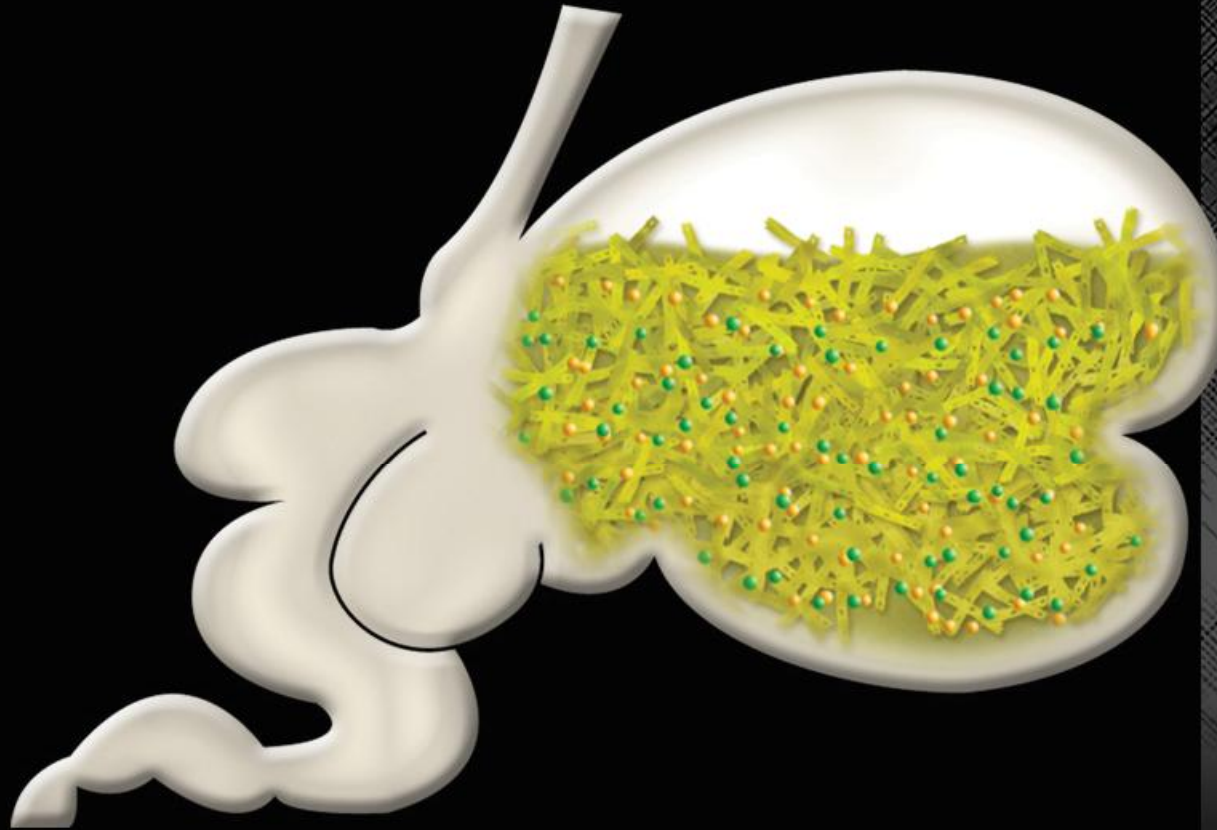


- Low density distribution of feed and specific fibre throughout the rumen liquor.

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# The Mech-fiber rumen



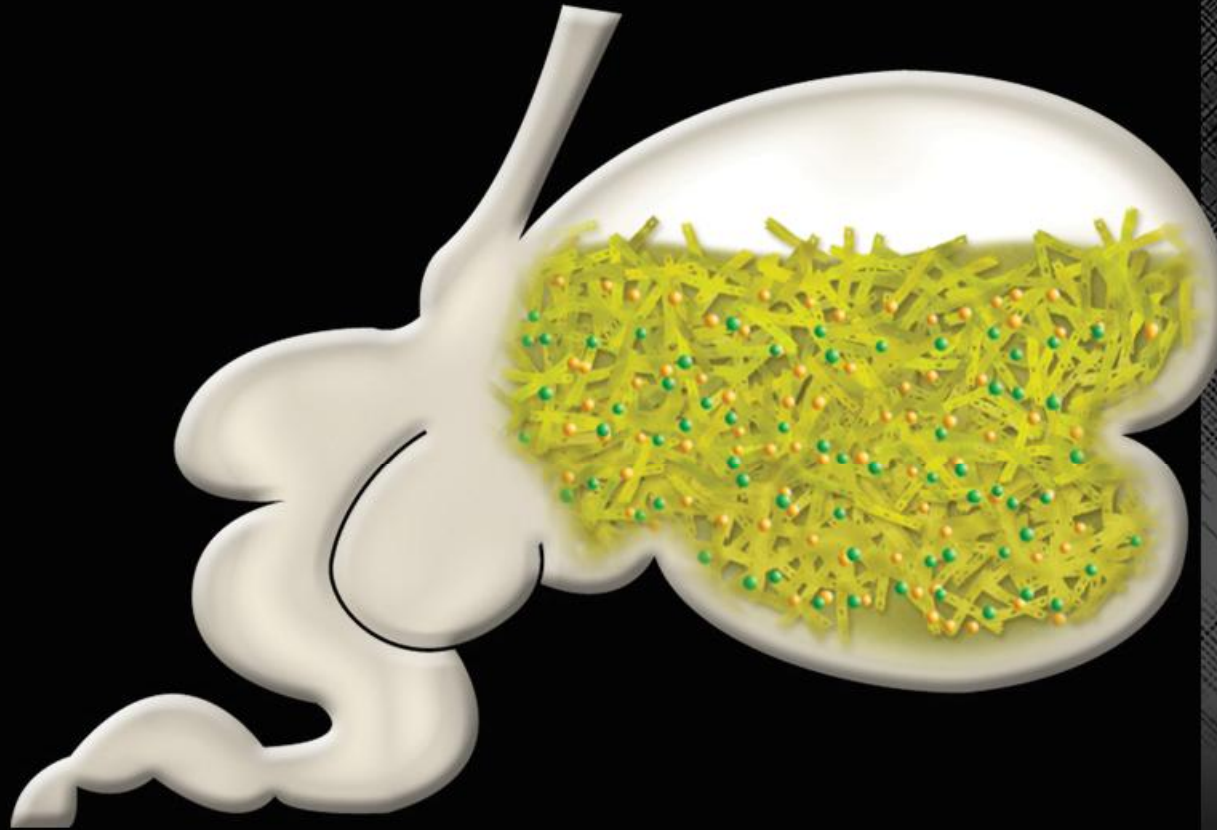
- Homogenous mix allows the enzymes and microflora to work to their optimum potential - quickly and thoroughly acting on nutrients to create improved conversion of feed into milk and meat.

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# The Mech-fiber rumen

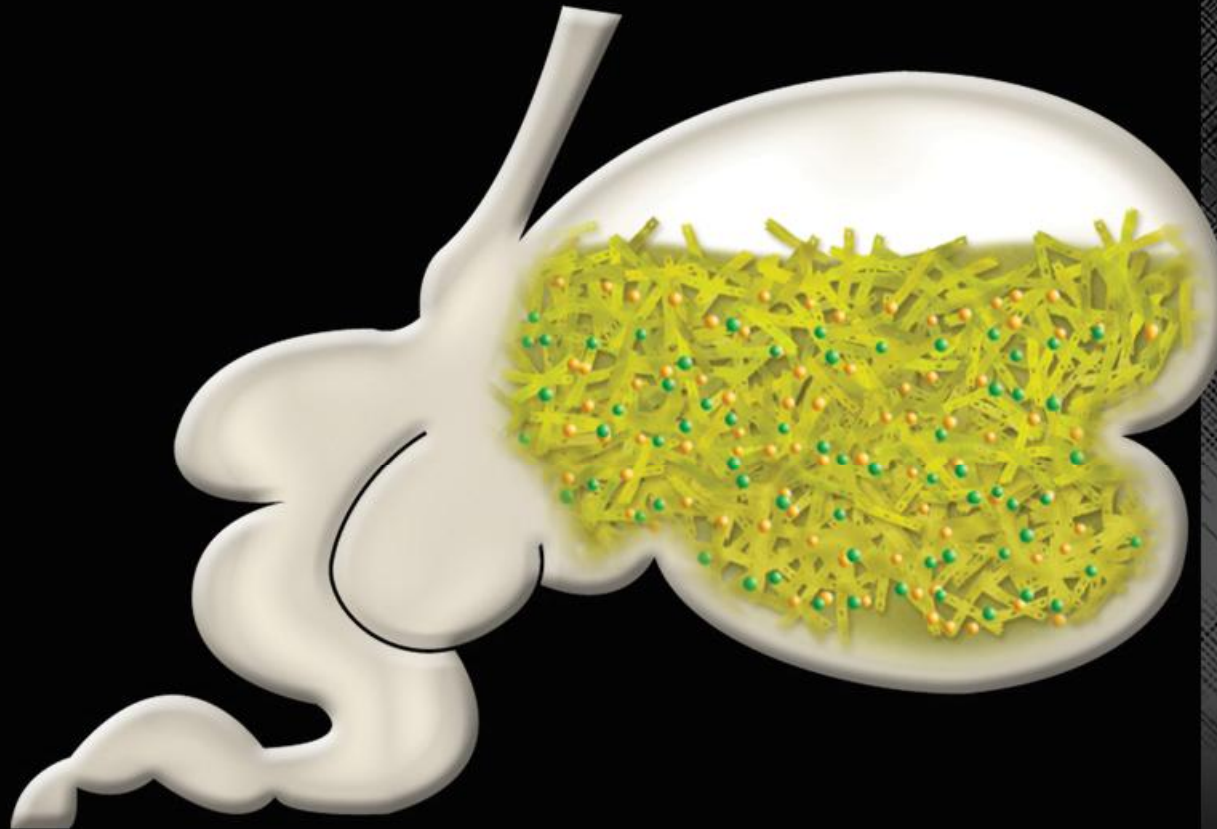


- High energy particles are held safely within the Mech-fiber where they are digested fully without creating acidic flare that can cause chronic health and fertility problems.

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# The Mech-fiber rumen



- Feeds digested more fully so less methane is produced per unit of output.

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# Delivering Mech-fiber on-farm

- Mech-fiber ration structure is unique to Keenan mixers

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# Impact of Mech-fiber rations: Seemingly subtle changes can lead to huge benefits

## 2 percentage unit increase in digestibility of ration:

Releases enough extra nutrients from the feed for >1.5 kg more milk.

Increases Feed conversion efficiency by >5%

Responses with Mech-fiber rations usually much larger



# 1. Mech-fiber effect - Coopon Carse

**Worth 32.5 pence/cow/day**

	Milk lts/d	Feed DM/d	FCE ECM/kg	Prot %	Fat %	Prot g/d	Fat g/d
Vertical Auger	28.5	22.9	1.25	3.26	3.82	929	1088
Keenan Mech-fiber	29.0	22.2	1.31	3.31	3.88	957	1122
Gain	+0.46 <sup>#</sup>	-0.75 <sup>*</sup>	+0.06	+0.05 <sup>□</sup>	+0.06 <sup>□</sup>	+27	+34

Gain = +0.46      -0.75      +0.06      +0.05      +0.06      +27      +34

- \* Less feed: 9.6 pence/cow/day
- # More milk: 11.6 pence
- Better milk quality: 11.3 pence





## 2. Mech-fiber optimised - Coopon Carse

**Worth £1.03/cow/day**

	Milk lts/d	Feed DM/d	FCE ECM/kg	Prot %	Fat %	Prot g/d	Fat g/d
Vertical Auger	28.5	22.9	1.25	3.26	3.82	929	1088
Keenan Mech-fiber	29.4	21.0	1.41	3.60	3.91	1059	1149
Gain	+0.91 <sup>#</sup>	-1.93 <sup>*</sup>	+0.16	+0.34 <sup>□</sup>	+0.09 <sup>□</sup>	+130	+61

Gain      +0.91      -1.93      +0.16      +0.34      +0.09      +130      +61

\* Less feed:      24.4 pence/cow/day

# More milk:      22.9 pence

□ Better milk quality:      55.5 pence

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# 3. Mech-fiber with PACE - Coopon Carse

Worth £1.41/cow/day

	Milk lts/d	Feed DM/d	FCE ECM/kg	Prot %	Fat %	Prot g/d	Fat g/d
Vertical Auger	28.5	22.9	1.25	3.26	3.82	929	1088
Keenan Mech-fiber	30.9	20.7	1.49	3.57	3.87	1103	1197
Gain	+2.40 <sup>#</sup>	-2.22 <sup>*</sup>	+0.24	+0.31 <sup>sq</sup>	+0.05 <sup>sq</sup>	+174	+109

\* Less feed: 28.4 pence/cow/day

# More milk: 60.3 pence

<sup>sq</sup> Better milk quality: 50.8 pence



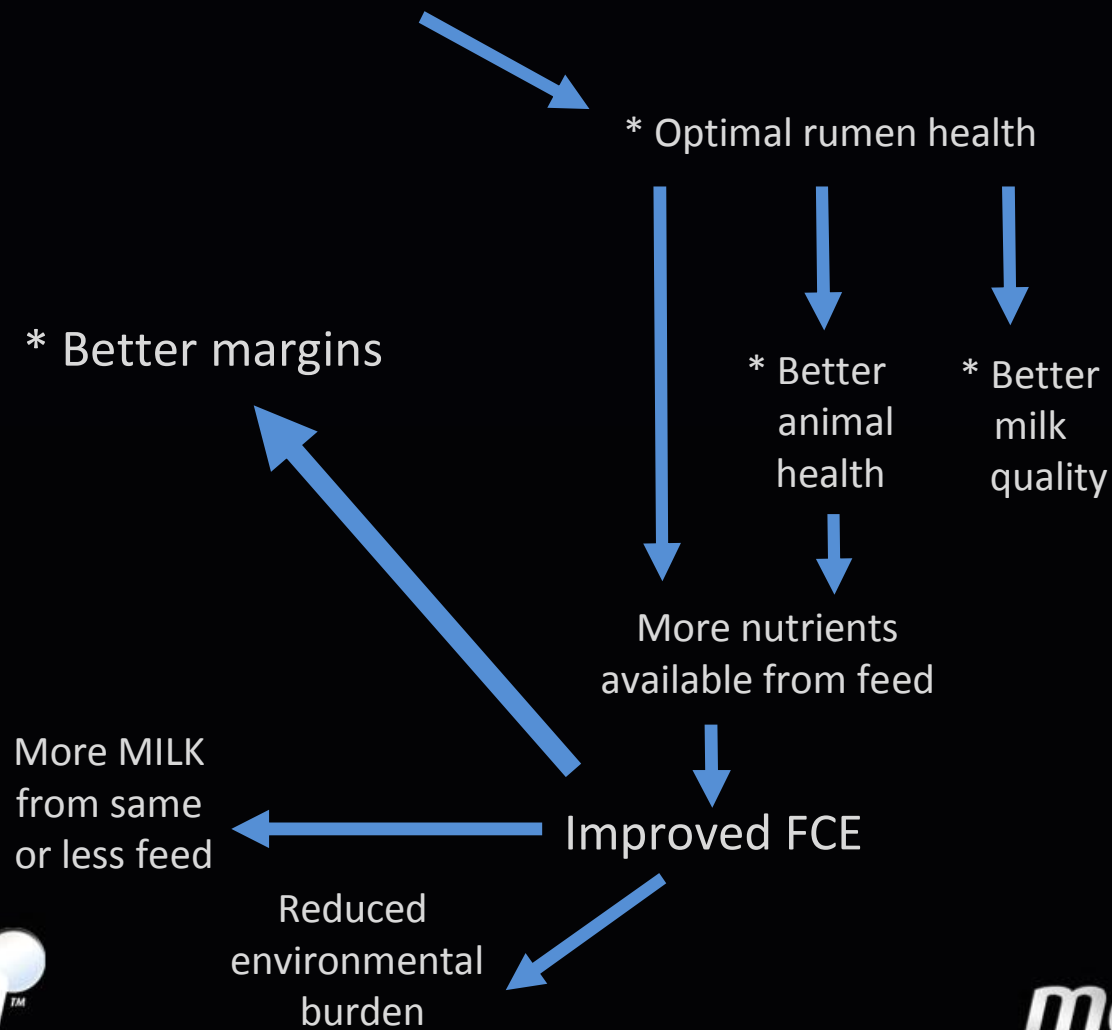
# Mech-fiber ratios at Coopon Carse

## Financial summary (£/day)

	Stage 1.	Stage 2.	Stage 3.
Feed saved	£43.2	£109.8	£127.8
Milk income	£52.0	£103.1	£271.4
Milk composition	£50.7	£249.8	£228.6
Total	£145.9	£462.6	£627.8



# Physical nutrition with Mech-fiber rations



# The Mech-fiber Breakthrough

**“A Seismic shift in ruminant feeding with genuine potential to revolutionise the way cows are fed in the future.”**



# The Science of Success





# *mech* *fiber*™ **PACE**

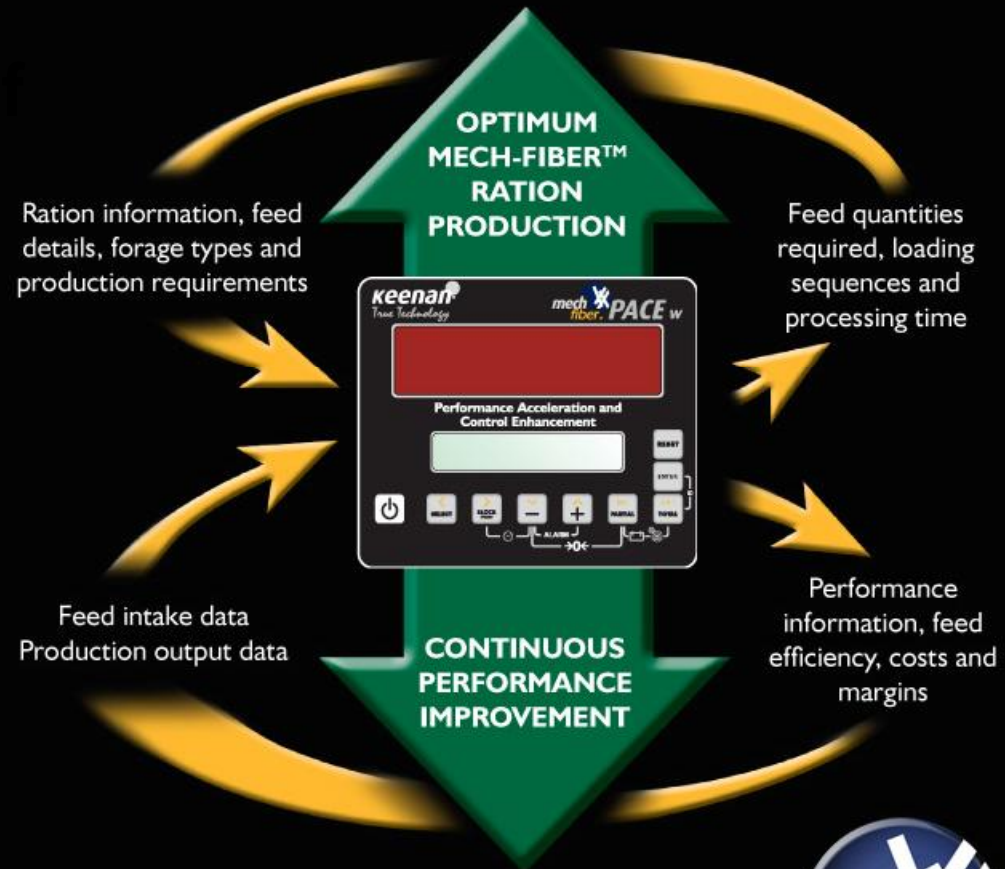
Performance Acceleration Control Enhancement

- Delivering the knowledge
- Reducing the variation
- Improving performance

# PACE: Performance Acceleration Control Enhancement

Maximise the Impact of  
Mech-Fiber

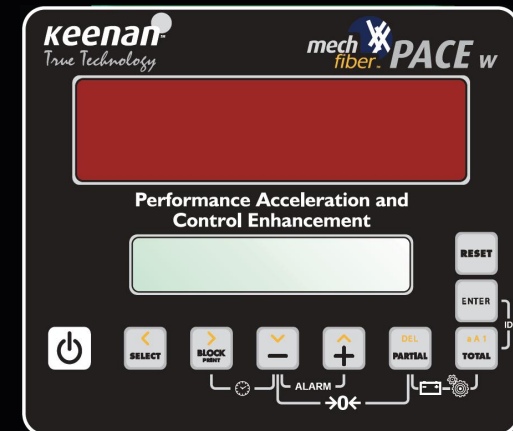
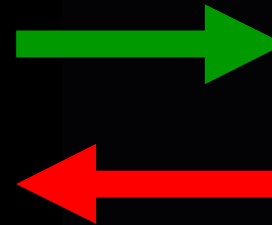
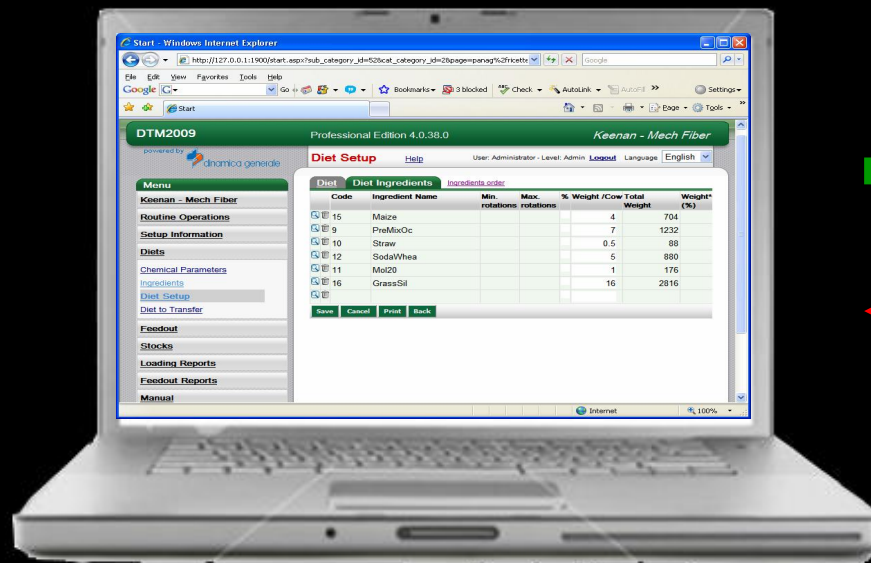
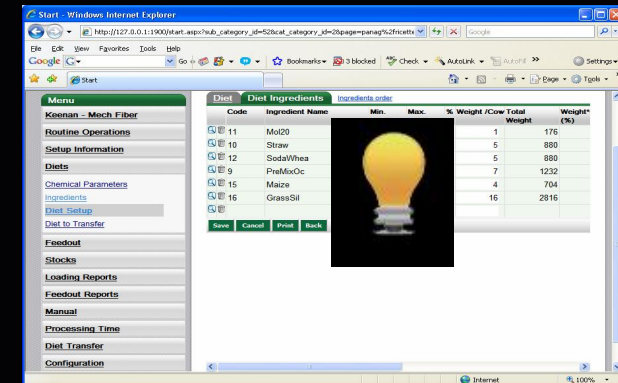
- Knowledge
- Software
- Hardware
- Feedback



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# How PACE is delivered on farm



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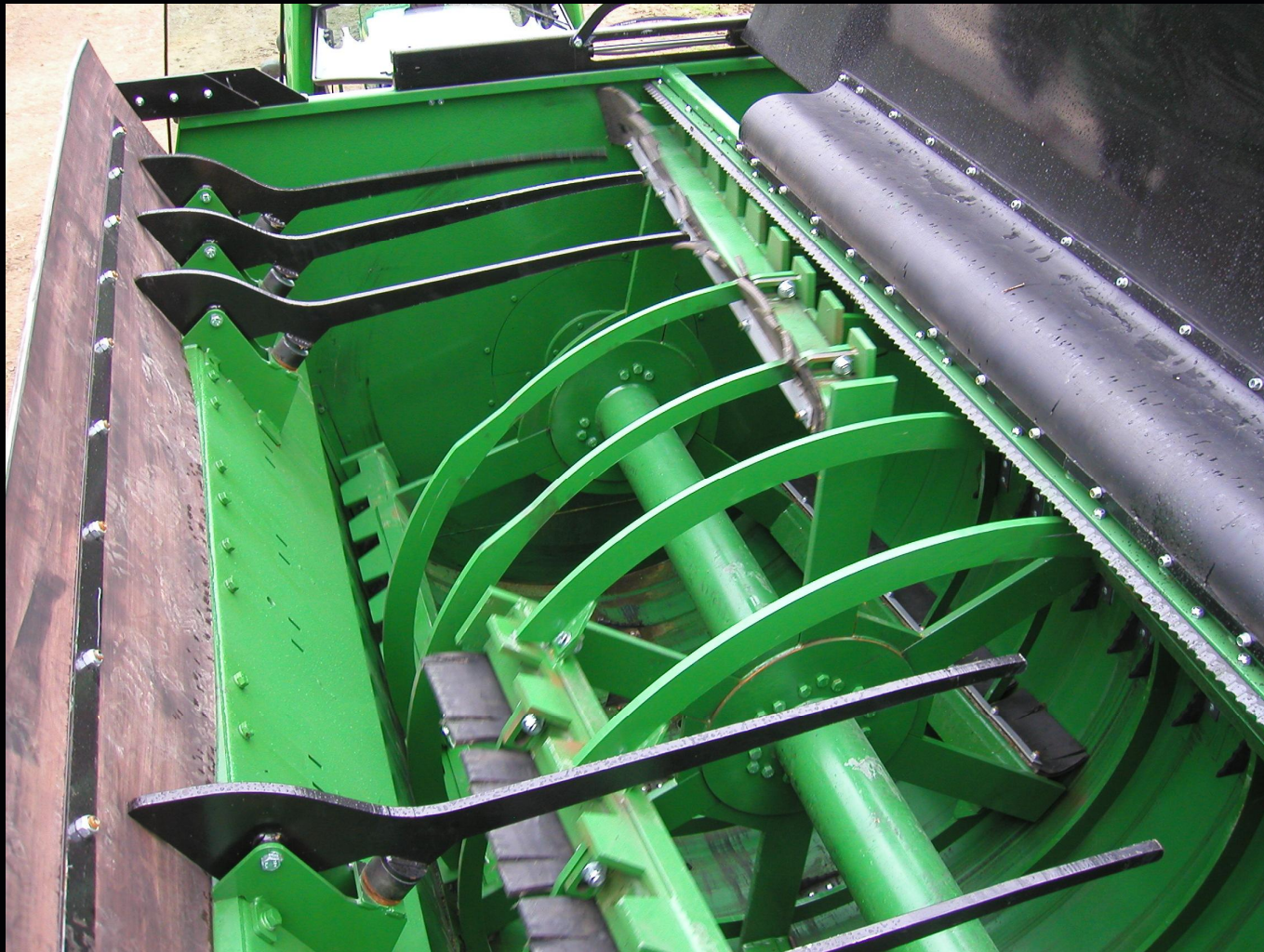
- 1. Mech-fiber Preparation:** on-farm commissioning of the monitoring processor, the customer's computer and data transfer via the web; algorithm (standard operating procedures) upgrades; help desk; software updates; nutritional support for first 6 months.
- 2. Performance Reports:** operating procedures compared with standard; feed efficiency; margins; progress; comparisons with peer group.
- 3. Payment Method and Cost:** Three year license and rental period; payable per month (via Keenan Credit/DLL).





**Customer control to consistently  
prepare optimal Mech-fiber  
rations**





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# Mech-fiber mixer-processor

- Light, low bulk density (fluffy mix).
- Gentle processing (mixes and chops without destruction).
- Deep tumble, all materials moving, fast processing of all forages.
- Low tractor power and fuel requirement.

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