

Dairy farming, technology and management in Israel:

General data and some nutritional and feeding aspects

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General information - the 2011 dairy herd book

2011 Production parameters and milk price

The Israeli Climate

Type of forages: winter; summer; & preservation

Imported ingredients of TMR

Local by-products

TMR usage

Table of content

Mixing wagons

Global market grain price

Milk cow TMR; Some other typical TMRs

General information - the 2011 dairy herd book:

- ~120,000 registered dairy cows (>94% of total cows).
- Cows are monthly recorded
- Annual production ~1.35 billion liters
- Liquid quota system
- Quota is regulated and re-calculated annually
- Regulation is according to annual average fat and protein percentage in raw milk and fat/protein demand and consumption
- Very few farms use bi-functional cattle (lower milk production but higher meat production)

General information - the 2011 dairy herd book, cont....

2 types of dairy sectors:

- 600 small "Moshav" family-farms (including few agricultural schools and 266 partnerships), 2X-3X, 40-200 milking cows/farm, producing ~43% of the national quota.
- 163 (43 partnerships) "Kibbutz" cooperative dairy farms, 3X, 300-1000 milking cows/farm, producing ~57% of the national quota.

General information - the 2011 dairy herd book, cont....

**Annual production data: 12,100
kg/cow, 3.70% fat, 3.28%
protein; culling rate, 29%**

[....check for historical data](#)

General information - the 2011 dairy herd book, cont....

Milk pricing:

The farmer is getting paid for both fat and protein (~35:65, respectively) and is getting paid only 10% for liquid.

A "target price" for "1 liter of standard milk" (3.7% fat; 3.31% protein, 1/2011) is guaranteed (~0.50\$) and is updated quarterly according to costs of production.

The Israeli Climate

Hot: summer, 30°C (86°F) along the coast and in the mountains; rises over 40°C (104°F) in the inland valleys and southern deserts.

Dry: short and limited rainy season in the winter, November - March (200-800 mm in the north; 0-25 mm in the far south).

The minimal precipitation needed for cultivating winter forage crops is ~300 mm. Drought is not infrequent (~twice per decade).

The Israeli Climate, cont...

Dairy farms are spread all over Israel in any mild/extreme weather conditions (desert, snow), within four geographical regions: three parallel strips running from north to south and the Negev desert, comprises 50% of land area.

As a result of extreme summer conditions, both DMI and milk production may decrease in summer by 15-20%, and conception rate may also markedly decrease.

The Israeli Climate, cont...

Intensive efforts are being made to relieve the heat stress during the summer, mainly through the use of showers combined with ventilation (evaporative cooling), both at the feeding bunk, lying and resting area and particularly in the milking parlor yard.

The Israeli Climate, cont...

"Kibbutz Maoz Haim", [dairy farm](#), is located in the "Bet Shean Valley", 10 miles south of Sea of Galilee, >200 meters **below** sea level. 270 dairy cows produced in 2011, 12000 kg/cow, 3.66% fat and 3.31% protein.

Water for irrigation of forage crop:

- Is expensive, mainly recycled water: partially purified sewage water and rain-reservoir water.
- Out of total land area of 28,000 km², 50% is semi-arid.

Most of the forages are winter crops:

- Wheat for silage is the main forage in Israel, used for milk cow TMR (70-80% of total silages).
- Price is 150-220\$/ton DM silage at the bunker (depend on winter precipitation, yield and wheat grain price).

Winter crops, wheat silage, cont...

Wheat is seeded in November; harvested in April, at milk-dough stage (maximum digestible DM yield/hectare); wilted for few h - 1 day, up to 30-35% DM, chopped and ensiled.

Most wheat hybrids are bi-functional - suitable for both forage crop and grain production.

After ensilage - silage has high NDF content (55-58%), medium protein content (7-11%) and medium NDF digestibility (45-50%).

Winter crops, cont...

- Wheat and oat hays are the main forage used in dry cow TMR;
- wheat straw is the main forage in heifers TMR and part of the forage in dry cow TMR.
- Varying amounts of winter legumes mainly vetch, clover, and pea for hay production: 13-16% CP, 45-50% NDF.
- Legumes are being used primarily for crop rotation; their proportion in milk cow TMR is low (5-7%); quality is medium; price is high, 180-250\$/ton.

Winter crops, cont...

Under extreme droughts - all kind of lignocelluloses are being used, mainly for heifers, including [cotton stalks](#), [corn straw](#), [clover straw](#), sunflower stalks (stem and head), humus straw, tomato stalks and more....

At extreme shortage in forages, wheat straw is imported (150-160\$/ton); Also some “forages like” forages are imported such as [alfalfa pellets](#), [alfalfa wafers](#) and wheat straw pellets

Main summer (April-October) forage is:

- Well-eared [corn for silage](#), irrigated mainly with recycled water, comprises annually 10-30% of total silages in milk cow TMR (160-250\$/ton DM silage at the bunker).
- Small amounts of medium quality alfalfa hay for calves, irrigated with marginal water sources (in Jordan valley-mainly brackish, price>270\$/ton). Some negligible amounts of [alfalfa haylage](#) for milking cows.
- Small amounts of tropical grasses (panicum and some sorghum type hybrids) for hay production irrigated mainly with sewage water.

Preservation and storage:

In general, the ensilage process and technology is highly maintained and provide a high quality silage. Silages are packed and stored only in concrete bunkers.

(Check out for bad quality silages: before and after exposure)

Silage comprises above 90% of the forages in milk cow TMR.

Hay is stored in barns, or outside, according to climate. Rate of hay incorporation into TMR is low, ~5-10%.

Imported concentrates (~ 50% of TMR)

- All cereal grain, mainly barley & corn (but also rye, sorghum, oats & wheat) comprising 25-35% of TMR, (having various rumen-starch-degradability).
- High CP meals: corn germs, corn gluten, canola, cotton, sunflower, peanut.
- Some dry, high-protein &/or high-NDF by-products: DDG, DDGS, corn gluten feed, beet pulp, soy hulls.
- Alfalfa and wheat straw pellets (during drought).
- SBM is locally produced as a "by-product" of the oil industry, using imported soybeans.

Local by products - the cows is the main contributor for ecology & environment!

Massive use of local high NDF, medium-highly digestible by products:

- Substituting some of the starch of grains
- Compensating for the low forage diet
- Contributing to normal rumen function

*Wet citrus pulp, mainly fresh in the winter, some ensiled in the summer, 20-35\$/ton (as fed); its proportion in milk cow TMR is 5-8%, and 10-15% with heifers TMR.

Local by products cont..

*Wheat bran, brewers grain, wet corn gluten feed, soy hulls (or soy hulls + liquid molassa, 1:1)

Other by-products are being used:

*Vegetables (surplus production: potatoes & hulls, carrots, dates, avocado, watermelons, citrus etc.).

*By product from the sweet corn industry

*Coffee pulp (almost zero nutritional value).

*Grape hulls & seeds (winery by product);

*Tomato hulls (pulp); Peanut hulls; Sunflower hulls.

*By product of the citric acid industry (fungi).

Local by products cont..

*Liquid whey (4-5% DM, ~0.03\$/ton, as fed) and concentrated whey (10-20% DM);
more than 50% of the total whey production by dairy plants is utilized for feeding the milk cows, heifers, and steers.

Whey is formulated as a part of TMR, but is not incorporated within.

It is delivered to troughs, group consumption is regulated by “computerized irrigation system” (up to 2 kg DM/cow).

Whey is substituting mainly barley grain.

Local by products cont..

Cotton seeds (0-5% of TMR, ~200\$/ton):

- Short staple – [Pima](#), Akalfi
- Long staple - [Akala](#)

Cotton hulls - high NDF & very low digestibility.

[Cotton gin trash](#) (CGT) - mainly for heifers.

Some small amounts of [molasses](#) from the soy industry, and CMS, provided by yeast industry (also imported).

[Bakery waste](#), tomato, grape residues, peanut hulls and CGT are being used mainly with heifers TMR.

[Check for composition of some fibrous by products.](#)

Local by products cont..

Poultry manure (source - fattening poultry only):

Always processed (~35\$/ton AF):

- Ensiled with water/OP/potatoes;
- Aerobically treated;
- Oven heated;

PM is delivered only to heifers (~40% of total CP)

Chemical composition: 70-80% DM, ~30% CP, 50% of it as NPN, 3% Ca, 15-25% ash, 20-30% NDF,

Energy is a little higher than wheat straw.

Using TMRs

Most dairy farms are using TMR as their sole feeding system for all type of animals in the farm: milk cows, dry cows, heifers, steers and baby calves.

- TMRs are being produced at "on-farm" feed center or are purchased from a "near-by" feed center (0-250 km), some according to client specification and formulation
- Total cost=cost of feedstuffs+cost of processing+transportation+interest+depreciation + ~extra 10-15%).

Using TMRs, cont...

TMRs are being delivered from the feed centers to the dairy farm by:

- Regular trucks, or special trucks, equipped with special hydraulic chambers for different TMR or different customer (long distance).
- Special downloading wagons (medium distance).
- Self propelled mixing wagons (short distance).

Mixing wagons (MW):

All new versions of MW are routinely checked and confirmed for mixing uniformity (Ext. Service).

- Most types of MW are made in Israel (R.M.H, Lachish Industries)
- Few are static MW, most are mobile via a tractor or self propelled.
- Most of mobile-MW are horizontal, some are vertical.
- The most popular horizontal MW is the type having a "non-continuous" auger. These MW are resistant to long and flexible stem hays.

Grain Price

Global market grain-price plays a significant role in TMR formulation:

- Grain percentage and barley:corn ratio.
- The price of imported and local by products, and their rate of usage.
- The price of local forages, and their rate of usage.

In general, milk cow TMR is characterized by:

- Low forage diet: 30-38%, depends on:
 - ☞ Forage type - corn vs wheat silage.
 - ☞ Particles size & hay proportion.
 - ☞ Hay and silage quality.
- Low forage NDF (16-19%) and high non-forage NDF (32-38%) diet.

TMR characterization: cont...

- 16.5-17.0% CP (according to season and level of production), 30-36% of it as UIP.
- 35-40% NSC.
- 4-6% crude fat (according stage of lactation, fat sources, forage level, etc..)
- % DM: 50-60% (moisture sources are mainly silages and by-products).

TMR characterization: cont...

- ~0.5% NaCl, ~1% Ca, ~0.45% P and additional vitamins and macro and micro elements, supplied by premix (vitamins: vit E, 500; vit A, 200,000, vit D, 40,000, IU/day).
- Any formulation of TMR and/or concentrate mix is available from feed centers and/or feed mill, according to the dairy farmer's specific request.

Research & development, extension and field studies in dairy science

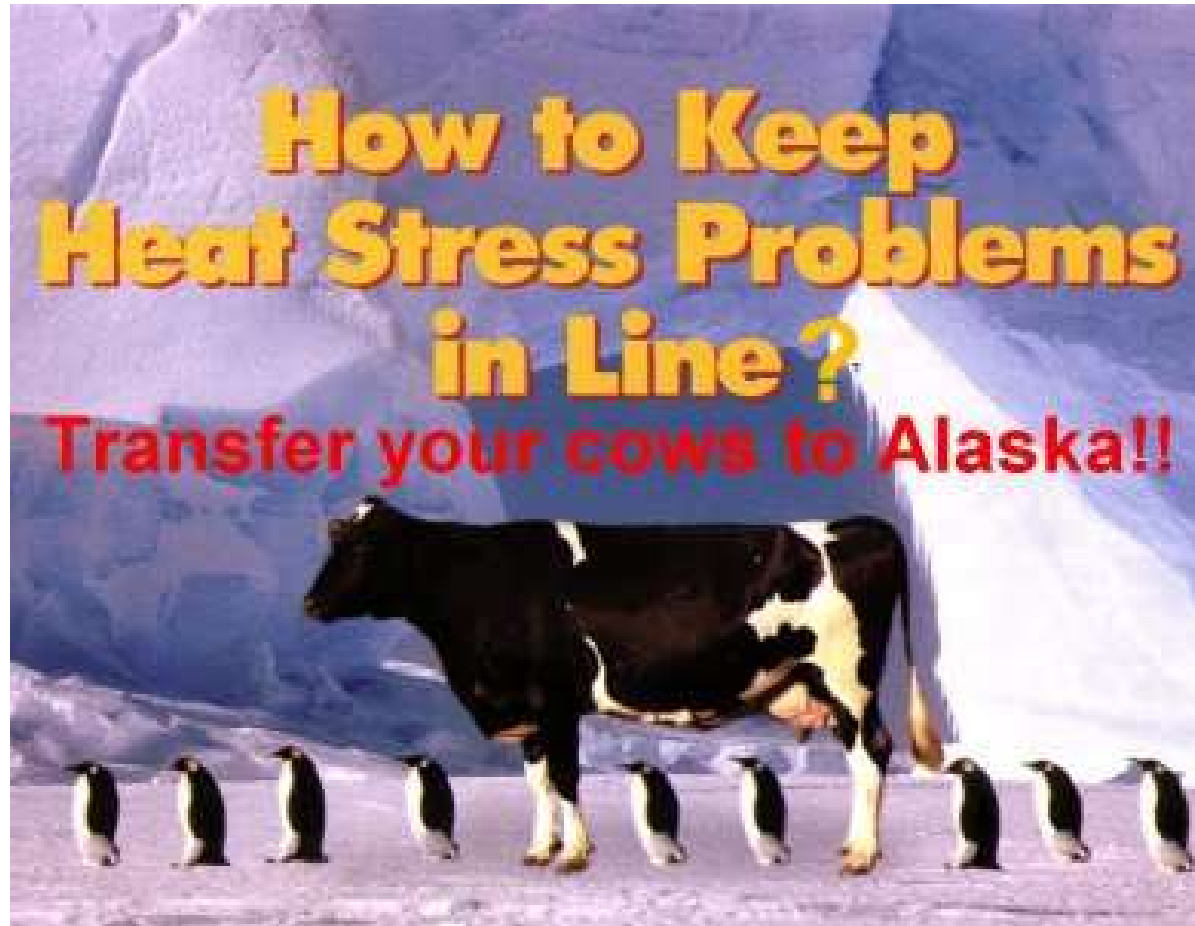
- Agricultural Research Organization, ARO.
- The faculty of agriculture.
- The Extension Service, Dept Cattle Husbandry.
- Regional R&D stations
- Most research is financed through International funds and the chief scientist, MOA.
- The Israeli Milk council in financing dairy research, some basic, but mostly applicable (1000000\$/year; money comes from the consumers).

R&D - some dairy pictures

- Metabolic Barn, ARO:
 - [General look](#)
 - [Rumen fistula](#)
 - [Intestinal fistulas](#)
- Individual feeding Barn, ARO:
 - [General look](#)
 - [Closer look](#)
 - [Special diet](#)
- Extension stuffs at field: [1](#), [2](#), 3

TMRs

- Milk cows TMR
- Dry cows TMR
- Pregnant heifers TMR
- Baby calves TMR



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Evaporative cooling at the bunk

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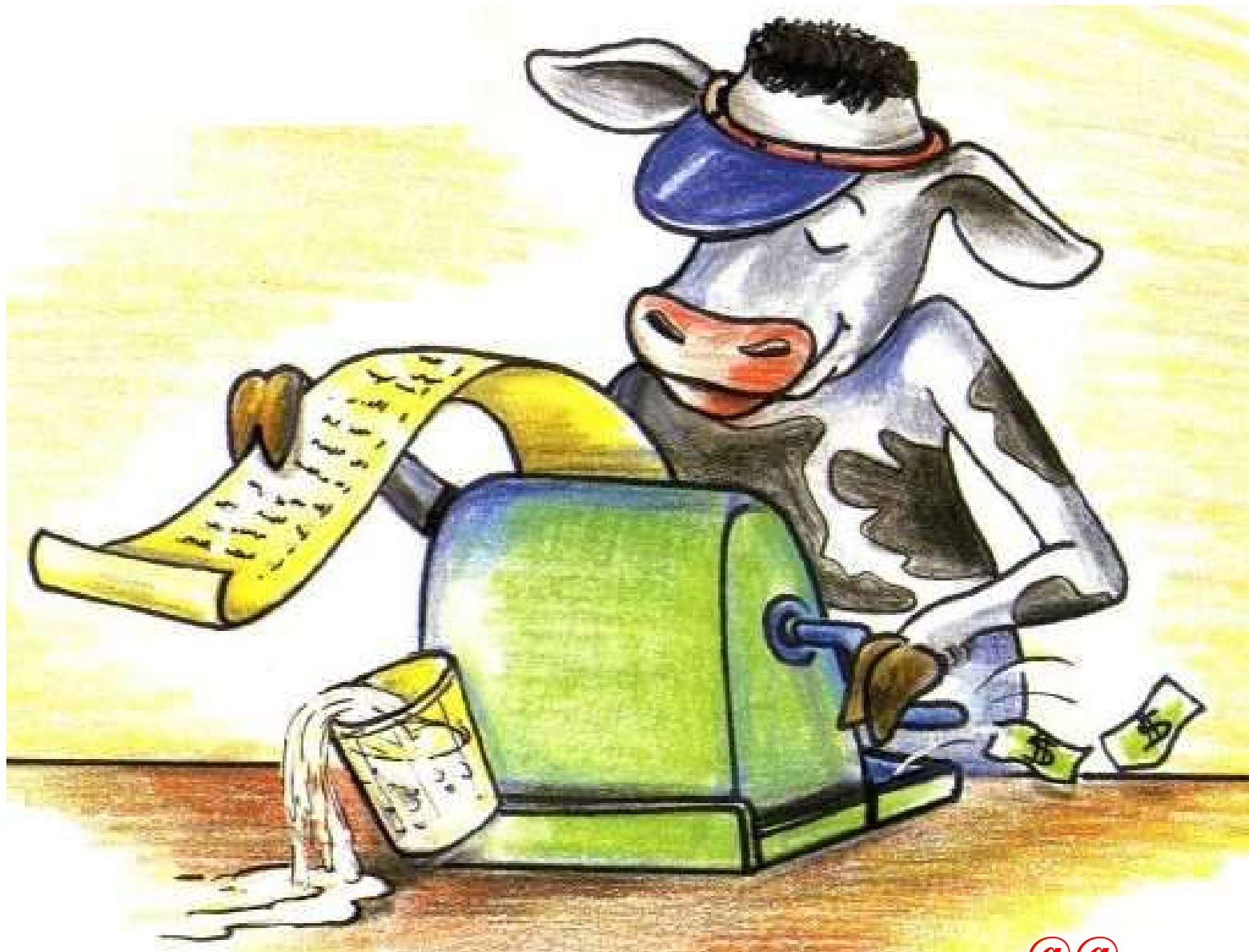




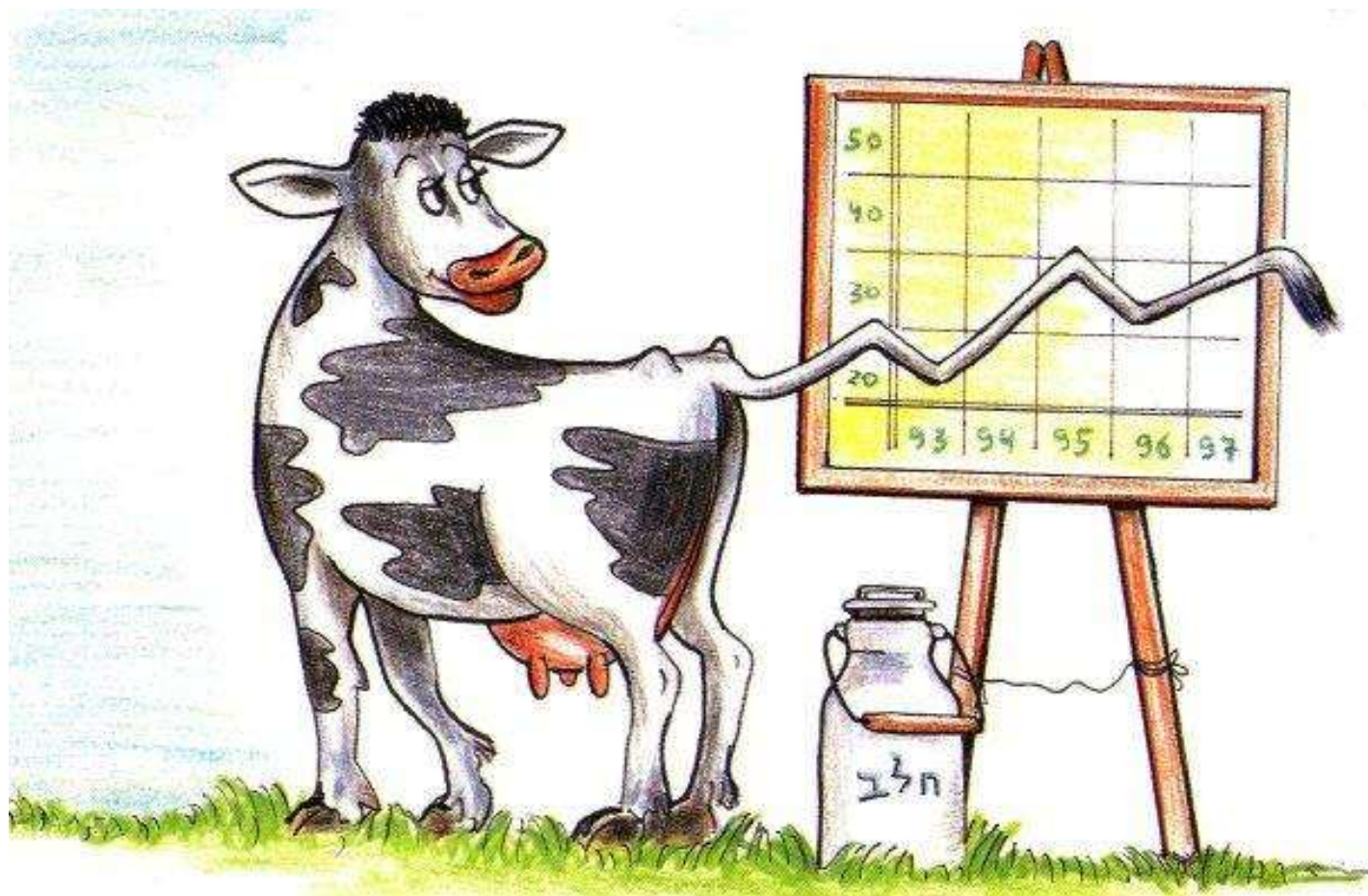
Production averages of Israeli-Holstein cows, by calving year 305-day- adjusted lactations (1-5)

Calving year	No. of cows	Milk, kg	Fat, %	Protein, %	•
1995	83,696	10,665	3.20	2.99	•
1996	81,477	10,665	3.26	3.02	•
1997	81,507	10,887	3.33	3.07	•
1998	82,004	10,850	3.31	3.08	•
1999	81,742	11,029	3.33	3.08	•
2000	81,622	11,048	3.37	3.08	•
2001	80,787	11,031	3.39	3.09	•
2002	86,554	10,890	3.48	3.11	•
2003	84,696	10,938	3.55	3.09	•
2004	84,694	11,200	3.54	3.08	•
2005	83,456	11,565	3.49	3.10	•
2006	77,334	11,506	3.52	3.14	•
2007	80,874	11,687	3.52	3.15	•





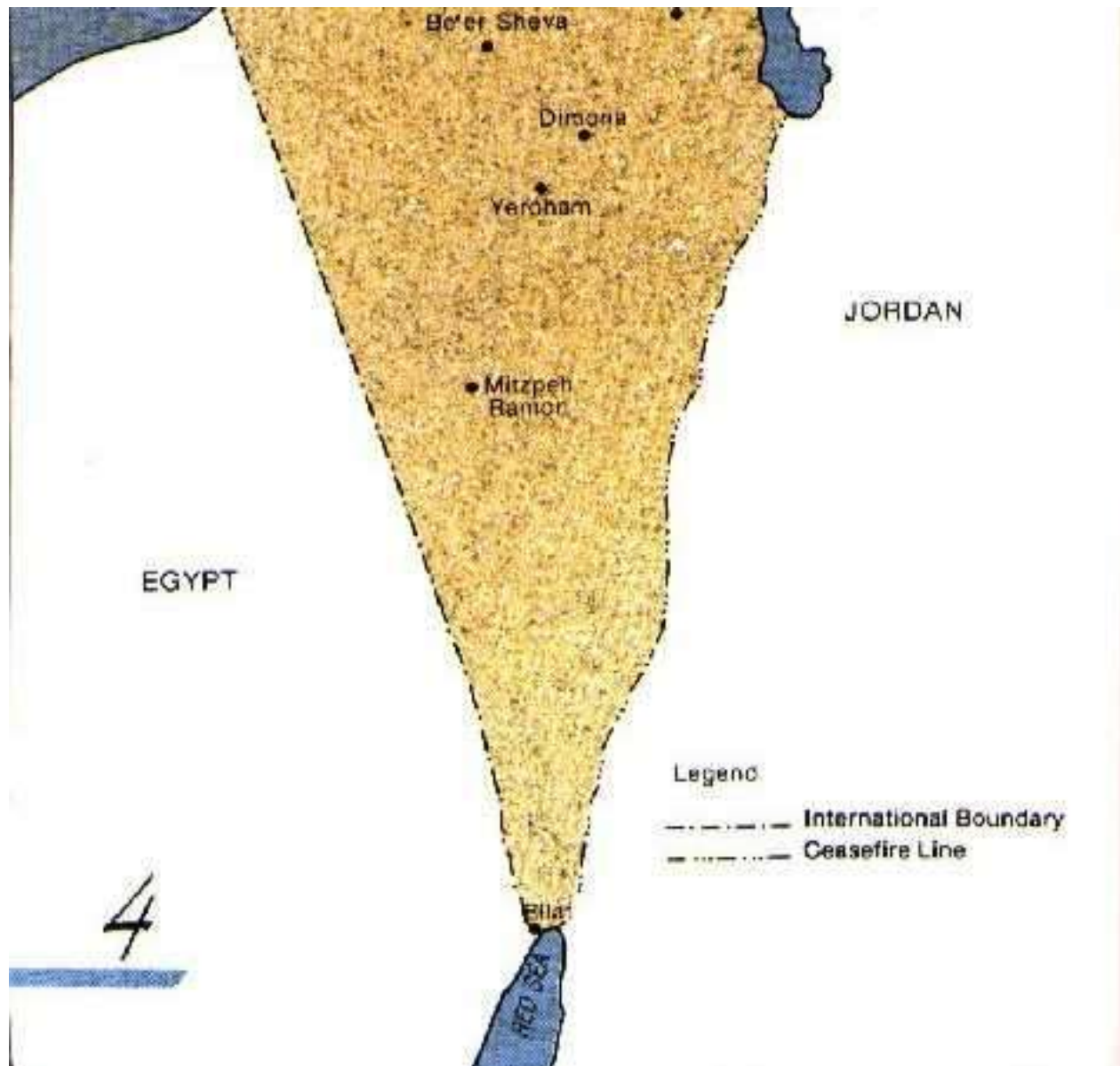
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Silage tower - A piece of HISTORY



Next...

Silos of concentrates



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Next...

Rye, close up

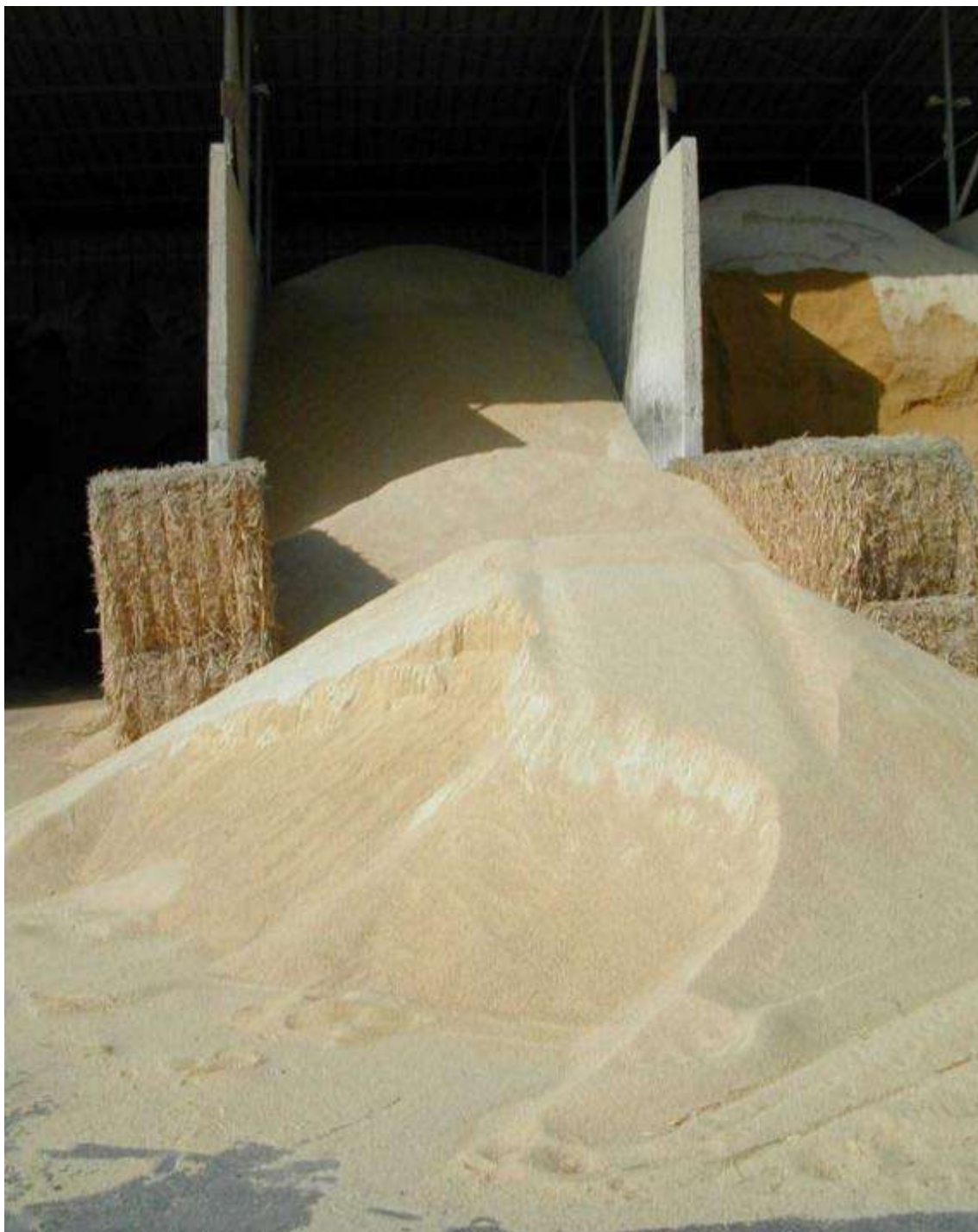




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Table 1. Dry matter and nutrient composition of fibrous byproduct feeds*

Feed	Dry Matter	Crude Protein	Protein Fractions ^b			ADF	NDF	Fat	Ash	NSC	Starch	NE _i
			SIP	DIP	UIP							
	(%)	(% DM)	----(% of CP)----			-----(% of DM)-----						Mcal/lb DM
Apple pomace	19.5	7.0	21.9	80	20	43.9	51.9	5.1	2.2	33.8	--	.71
Beet pulp	91.0	10.8	26.4	70	30	27.8	50.1	1.0	4.9	33.2	.4	.81
Brewers grain, dry	92.4	30.3	11.4	47	53	21.5	49.2	7.8	5.3	7.4	3.8	.68
Brewers grain, wet	21.6	28.7	10.5	66	34	22.4	47.0	7.9	4.6	11.8	3.8	.73
Citrus pulp	89.0	7.5	41.3	80	20	(22)	(23)	2.9	7.2	59.4	.2	.80
Corn gluten feed	88.0	24.2	47.7	70	30	12.4	37.6	4.2	6.1	27.9	23.3	.87
Cottonseed, hulls	89.0	9.6	21.9	--	--	61.0	75.6	6.0	3.3	5.5	1.0	.45
Cottonseed, whole	89.0	25.4	22.6	55	45	42.7	54.7	15.6	4.2	0.1	.3	1.01
Distillers grain, dry	88.7	29.0	14.6	38	62	20.3	41.1	10.2	4.6	15.1	2.4	.93
Distillers grain, wet	30.1	27.0	12.4	--		16.3	33.8	12.6	5.0	21.6	2.4	.93
Oat hulls	92.0	3.9				42.0	78.0	1.8	7.0	9.3	5.0	.34
Soy hulls	90.2	14.1	30.8			43.9	60.3	3.0	4.9	17.7	5.3	.80
Wheat midds	86.7	18.1	32.8	80	20	13.0	39.6	4.5	3.2	34.6	29.0	.71

*Derived from references 1, 2, 11, 12, 13, 14

^bSIP = soluble intake protein, DIP = degradable intake protein, UIP = undegraded intake protein



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Close-up



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Corn harvest for silage - small farm/feed center



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Feeds

	Feed	Quantity	Minimum	Maximum	Price	Shadow Pr.
1	Barley	Kg *	4.500	4.500	0.100	-0.031
2	Corn	Kg *	2.500	++++	0.140	0.015
6	Soya Meal	Kg	1.112	2.000	0.290	0.000
7	Gluten 60%	Kg	0.301	++++	0.410	0.000
11	Rape seed meal	Kg *	0.750	0.750	0.205	-0.006
13	CottonSeed	Kg	1.144	2.000	0.190	0.000
14	Citrus Pills	Kg	4.644	10.000	0.015	-0.000
18	Vetch Hay	Kg *	1.500	1.500	0.150	-0.010
28	Corn silage	Kg *	5.000	++++	0.065	0.002
29	Wheat silage	Kg	10.994	++++	0.058	0.000
31	DCP	Kg	0.046	++++	0.350	0.000
32	Salt	Kg	0.097	++++	0.095	-0.000
34	Limestone	Kg	0.223	++++	0.040	-0.000
35	Vit.Mix	Kg	0.045	++++	0.750	-0.000
36	Wheat Bran	Kg *	1.500	1.500	0.080	-0.032
38	Brewers Gr	Kg	1.733	4.000	0.035	0.000
40	Gluten feed	kg *	1.000	1.000	0.132	-0.042
42	Fish Meal	Kg *	0.250	++++	0.720	0.253
43	Adolak BP fat	Kg *	0.250	0.250	0.630	-0.047
46	Urea	Kg	0.062	++++	0.306	-0.000
47	Oil	kg *	0.050	0.050	0.500	-0.124

	Nutrients			Quantity	Minimum	Maximum	Shadow Price
1	dry-matter	kg	*	10.000	10.000	10.010	0.129
2	Wet-matter	kg		13.870		++++	
3	protein	kg		1.200		++++	
9	CA	g		26.511		50.000	
10	Phosphorus	g		24.730		++++	
13	Vit-A	IU	*	50.000	50.000	++++	
14	NEl	Mcal		14.000		++++	
16	Forage DM	Kg		7.500		++++	
1	[3/1]		*	0.120	0.120	++++	
2	[14/1]		*	1.400	1.400	++++	
3	[16/1]		*	0.750	0.750	++++	

Feeds

	Feed			Quantity	Minimum	Maximum	Price	Shadow Pr.
1	Barley	Kg		1.706		++++	0.100	0.000
6	Soya Meal	Kg		1.097		++++	0.290	-0.000
20	Wheat Hay	Kg		5.255	5.000	++++	0.100	-0.000
24	wheat straw	Kg		1.801	1.500	2.000	0.050	0.000
29	Wheat silage	Kg	*	4.000	4.000	4.000	0.058	0.012
35	Vit.Mix	Kg		0.012		++++	0.750	-0.000
2	Corn	Kg				++++	0.140	0.055

14	NE1	Mcal	10.780		++++	
16	Forage DM	Kg	3.380	3.200	4.000	
20	NPN	g	225.000		++++	
1	[3/1]	*	0.130	0.130	++++	
2	[14/1]		1.347	1.340	1.350	

Feeds

	Feed	Quantity	Minimum	Maximum	Price	Shadow Pr.
1	Barley	Kg *	1.000	1.000	0.100	-0.018
14	Citrus Pills	Kg	4.036	8.000	0.015	0.000
24	wheat straw	Kg *	3.000	3.000	0.050	-0.057
29	Wheat silage	Kg *	2.000	2.000	0.058	0.015
35	Vit.Mix	Kg	0.012	0.750	0.750	0.000
36	Wheat Bran	Kg *	1.500	1.500	0.080	-0.040
40	Gluten feed	kg	0.515	1.000	0.132	0.000
44	Poultry manure	kg *	2.000	2.000	0.040	-0.081
5	Tapiuka	Kg			0.080	-0.019
11	Rape seed meal	Kg		++++	0.205	0.042
20	Wheat Hay	Kg			0.100	-0.009

Matrix:	Ran's Matrix	Ration	7: Young calv	Cost:	149.13
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Nutrients

	Nutrients			Quantity	Minimum	Maximum	Shadow Price
1	dry-matter	kg		883.188		++++	0.127
2	Wet-matter	kg	*	1000.000	1000.000	1000.010	
3	protein	kg		158.974		++++	
6	N.D.F.	kg		213.542		++++	
9	CA	g	*	5500.000	5500.000	6000.000	
10	Phosphorus	g		4236.655	4000.000	++++	
12	Salt	g	*	4500.000	4500.000	5000.000	
13	Vit-A	IU	*	12000.000	12000.000	++++	
14	NEl	Mcal		1624.241		++++	
16	Forage DM	Kg		86.000		++++	
1	[3/1]		*	0.180	0.180	++++	
2	[14/1]			1.839	1.800	++++	

Feeds

	Feed	Quantity	Minimum	Maximum	Price	Shadow Pr.
1	Barley	Kg	363.910	++++	0.100	-0.000



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Normal CGF

Close up



Next

“Burned” CGF



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Next





Next



Fish meal



Close up



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Next

Potatoes & potatoes hulls

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Next



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Corn

Next...

Ground corn



Next

Ground corn, close up



Next

“Cracked” corn



Next

“Cracked” corn, close up





Next





Next



Next

Ground barley



Next





Next

Alfalafa haylage close up





Next



Next





**Good quality
wafers**

**Burned
wafers**

Alfalfa pellets







Cotton stalks, on-farm, chopped & piled

Cotton stalks
post harvest













Flies trap

33











Hill shaped barn





Beef cattle at the dairy farm

Electric dog





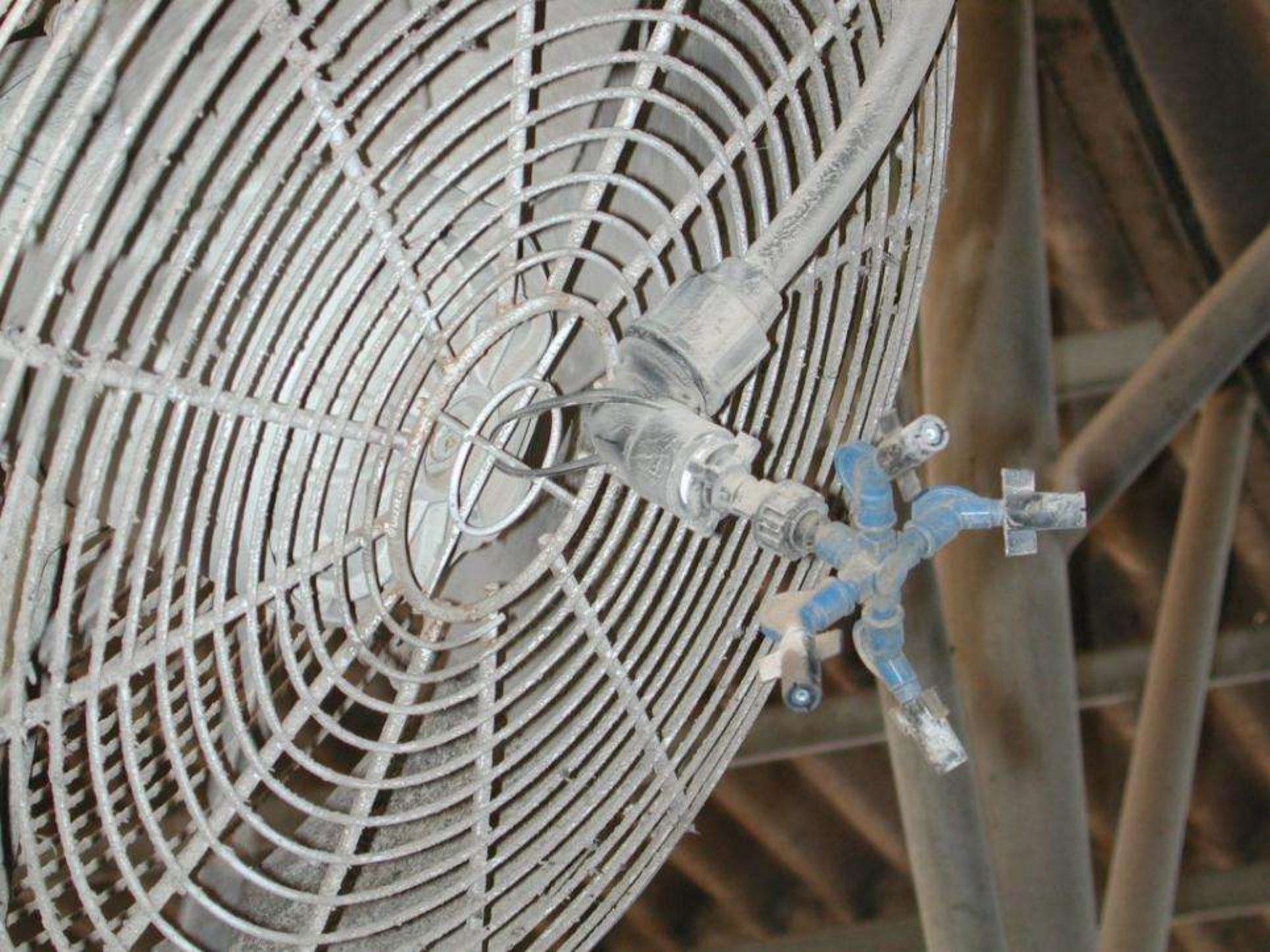




























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