

# Improve business by managing health

## Farm-O-San FLS







# Fatty Liver Syndrome can be a “silent” killer

**Fatty Liver Syndrome (FLS) can present itself in various ways. In some flocks, FLS results in a drop in egg production of up to 25 or 30%, without significant mortality. In other flocks, FLS results in mortality of 5 to 10%, with only a minor drop in egg production in the surviving birds.**

## **When does Fatty Liver Syndrome occur?**

During peak production, young hens have high levels of oestrogen, and they are in negative energy balance. As a result, they will start to convert carbohydrates to fatty acids, and they will mobilise fatty acids from adipose tissue. If transport of fatty acids out of the liver can't match the fatty acid synthesis for egg production and influx from adipose tissue, fat starts to accumulate in the liver, resulting in FLS.

At the end of the laying cycle, lower egg production results in lower energy requirement of the birds. If feed intake isn't reduced, excess carbohydrate is metabolised into fatty acids in the liver. This may result in an increase in fat deposition in the liver, resulting in FLS.

## **How to diagnose Fatty Liver Syndrome?**

Next to the drop in egg production and the increase in mortality, flocks suffering from FLS can have birds with sunken eyes and pale to yellow combs. These are all very a-specific symptoms. If FLS is suspected, a diagnosis can be made by section. Enlarged, pale and friable livers with abnormal amounts of fat in the abdominal cavity will be found. Liver fat percentage in birds suffering from FLS can be as high as 70%. Livers of affected birds become very fragile and liver damage, particularly bleedings, are common.



### What are the risk factors for Fatty Liver Syndrome?

It is not fully understood why FLS occurs in some flocks and not in others. Certain diets increase the risk to develop FLS. These are diets with:

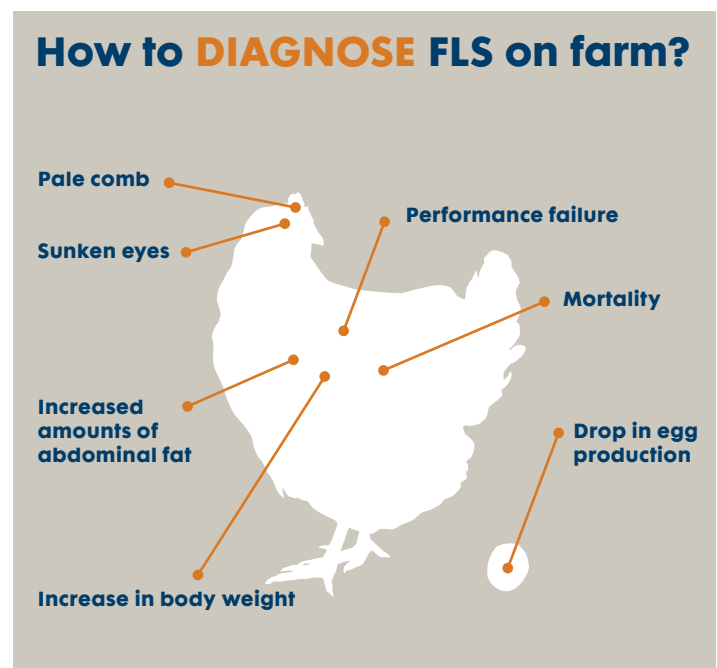
- A low level of the amino acids necessary for fatty acid transport to adipose tissue
- An incorrect balance between protein and energy
- High levels of carbohydrates (i.e. starch)
- Insufficient levels of unsaturated fatty acids (i.e. linoleic or arachidonic acid)

Diets should also contain sufficient amounts of:

- Methionine
- Choline
- Phospholipids
- Vitamins that support fatty acids transport and/or energy metabolism (like biotin and vitamin B12)
- Antioxidants
- Calcium

Factors not related to diet can also have an impact. FLS occurs more frequently:

- In caged birds compared to free roaming animals
- During periods of high temperature
- In countries/seasons with shorter periods of daylight, as birds are less active when it is dark
- In flocks exposed to mycotoxins, bacterial toxins or certain pesticides
- During periods of stress





# Farm-O-San FLS: Reducing the risk of fatty liver syndrome



**Farm-O-San FLS is a dietetic feed for fatty liver syndrome in laying hens. It is available in two different formulations.**

**Farm-O-San FLS Liquid** can be given via drinking water, allowing immediate intervention once problems with FLS occur.

**Farm-O-San FLS Mix** can be included in feed, to be given during periods of high risk or when this risk is expected. Both formulations contain a number of ingredients with proven benefits in layers and breeders running the risk to develop FLS.

**Poly Unsaturated Fatty Acids**

Farm-O-San FLS contains Poly Unsaturated Fatty Acids (PUFA's). Administration of PUFA's reduces the conversion of carbohydrates to fatty acids via an integrated negative feedback system, reducing the risk of accumulation of fat in the liver.

Next to that, Farm-O-San FLS contains a number of vitamins that stimulate or support liver function:

- Choline and vitamin B12 maintain proper fat transport out of the liver as lipoproteins. These components provide phospholipids, the building blocks for lipoproteins.
- Biotin and vitamin B1 improve carbohydrate and glucose utilisation. Biotin is also an active component in the integrated feedback system for fatty acid production mentioned earlier.

Lastly, Farm-O-San FLS contains vitamin E, selenium and Trouw AO Mix, which have **antioxidant activity**, birds with FLS benefit from this activity by maintaining a correct free radicals balance.



# Trials carried out with Farm-O-San FLS

A number of trials were carried out with Farm-O-San FLS. The results of two trials conducted at Trouw Nutrition Poultry Research Centre are presented here.

## Trial 1, material and methods

Six groups of 288 individually caged healthy ISA Brown laying hens, 60 weeks old, were used in this trial. Half of the animals received a normal diet, the other half of the animals were fed a challenge diet resulting in fatty liver syndrome. In each of the two groups, one third of the animals was supplemented with Farm-O-San FLS-Liquid, one third with Farm-O-San FLS-Mix and one third was not supplemented.

Several parameters related to the health of the liver were tested and bodyweight was compared between groups.

### Minolta value for liver colour

In the Minolta system, scores are given on three axes:

- Dark vs. light
- Yellow vs. blue
- Green vs. red

Minolta values are presented in table 1



Table 1: Minolta values for liver colour in laying hens treated with Farm-O-San FLS and in untreated controls.

Diet	Treatment	Score for liver colour		
		L	a+	b+
Normal diet	Controls	43.10	12.61	17.06
	Farm-O-San FLS Mix	42.54	12.69	15.37
	Farm-O-San FLS liquid	42.45	12.45	15.54
Diet resulting in Fatty Liver Syndrome	Controls	47.15	12.61	23.98
	Farm-O-San FLS Mix	43.07	13.03	16.67
	Farm-O-San FLS liquid	43.69	12.77	19.37

Table 2 - Bodyweight and liver fat percentage are presented in table 2.

Bodyweight and liver fat percentage in hens treated with Farm-O-San FLS and in untreated controls.

		Bodyweight	Liver fat %
Normal diet	Controls	1998 g	19.47%
	Farm-O-San FLS Mix	2032 g	18.32%
	Farm-O-San FLS liquid	2027 g	18.57%
Diet resulting in Fatty Liver Syndrome	Controls	1888 g	34.77%
	Farm-O-San FLS Mix	1962 g	20.45%
	Farm-O-San FLS liquid	1955 g	24.54%

## Trial 1 results

Treatment with Farm-O-San FLS resulted in a significant improvement of all liver parameters tested.





### Trial 2, materials and methods

A model to induce fatty liver syndrome was used in the trial. A high energy-low protein diet was fed to 288 ISA Brown laying hens at 72 weeks of age for a period of 2 weeks. Half of the birds received Farm-O-San FLS-Mix for a period of 3 weeks, the other half of the birds served as untreated controls. The following parameters were measured during the 3 week period the birds were fed Farm-O-San FLS: (see table 3)

- Egg lay percentage
- Percentage of shell-less eggs
- Percentage of broken eggs
- Feed intake

After 3 weeks, necropsy took place, and the livers were scored for abnormalities and fat percentage. (see table 4)

Table 3: performance parameters in birds treated with Farm-O-San FLS compared to untreated controls.

	Egg lay percentage	Percentage of shell-less eggs	Percentage of broken eggs	Feed intake
Controls	<b>79.6%</b>	<b>2.6%</b>	<b>5.1%</b>	<b>103.6 g/day</b>
Farm-O-San FLS	<b>85.2%</b>	<b>1.6%</b>	<b>3.4%</b>	<b>107.3 g/day</b>

Table 4: liver fat expressed as percentage of dry matter and score for blood spots in the liver in birds treated with Farm-O-San FLS compared to untreated controls.

	Liver fat percentage	Average score for blood spots in liver
Controls	<b>25.0%</b>	<b>2.6</b>
Farm-O-San FLS	<b>19.2%</b>	<b>1.6</b>

**Score for blood spots:** 0 = none visible;  
 1 = spots < 0.5 cm;  
 2 = spots > 0.5 cm;  
 3 = ¼ of liver surface with blood spots;  
 4 = ½ of surface with blood spots.

### Trial 2 results

**Treatment with Farm-O-San FLS resulted in improved liver health parameters, a higher bodyweight and better production performance.**

# Managing Fatty Liver Syndrome with Farm-O-San FLS

## Treatment schedule Farm-O-San FLS in case of Fatty Liver Syndrome

Once symptoms of Fatty Liver Syndrome have been observed, Farm-O-San FLS should be used for at least 21 days.

## Prophylactic application of Farm-O-San FLS on Fatty Liver Syndrome

To reduce the risk of FLS in **laying hens**, Farm-O-San FLS should be used at peak production around week 28 and at the end of the laying cycle around week 50, in both cases for a period of 10-14 days

To reduce the risk of FLS in **breeding hens**, administration of Farm-O-San FLS should be repeated every 6 weeks for a period of 10-14 days, from the start of the laying cycle onwards.

## Conclusions

- Fatty Liver Syndrome is an underdiagnosed problem
- It can result in a drop of egg production of 25-30% and mortality of 5-10%
- Diet plays an important role in the prevention of FLS
- Farm-O-San FLS is a proven solution to manage FLS.



Farm-O-San FLS  
Liquid



Farm-O-San FLS  
Mix

## Other poultry products from Farm-O-San



[farmosan.com](http://farmosan.com)

 **trouw nutrition**  
a Nutreco company

Farm-O-San is a brand of Trouw Nutrition, a Nutreco company. For more information [www.trouwnutrition.com](http://www.trouwnutrition.com)  
Trouw Nutrition Veerstraat 38 5830 AE Boxmeer The Netherlands

TN-10028/JU15/FOS FLS/JU15/CEN