

# Transforming Olive Waste into Animal Feed

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## Abstract

Over 7 million tonnes of solid Olive Oil Waste are produced in the Mediterranean each year [1], however the European Union does not provide specific provisions or regulations for the processing or disposal of Olive Mill Wastes [2]. Known as Olive 'Pomace', these wastes are an environmental hazard. The current waste management practices in the olive oil sector result in environmental problems such as soil contamination, underground seepage, water-bodies pollution and foul odor emissions [3]. Olive Waste treated in Pomace factories produces air pollution while having a low caloric fuel value of 20 MJ/kg which is less than coal, and over 50% less than natural gas and oil [4].

Attempts to use Olive Waste as an animal feed while showing a variety of benefits have been shown not to be commercially viable due to problems with Digestibility, Palatability and Safety [5,6]. The Olive Feed Corporation have invented a proprietary cooking process which solves the issues of Digestibility, Palatability and Safety that have previously prevented the successful commercial establishment of Olive Waste or Olive 'Pomace' as an animal feed. The final meat product known as "Olive Fed Wagyu" showed significant improvements in flavour, texture and overall eating experience, while also delivering an increase in revenue to the farmers producing the meat.

## Background

With Olive Waste considered to be a critical problem in all Olive Oil production countries and particularly the Mediterranean, and without uniform guidelines of disposal and use from country to country it poses a significant threat to the environment and the Olive Oil production industry as a whole. In the countries where it is regulated such as Australia small Olive Oil farms can barely afford requirements for waste disposal. In the European Union, Olive Pomace factories are producing a Bio-Fuel that can be considered low energy, while also contributing to air pollution when it is burned to produce energy. In countries across North Africa and the Middle East Olive Waste is often found dumped across the country side. This leads to an extensive range of negative affects including soil poisoning, plant poisoning, animal poisoning and air pollution [7].

Olive Waste as an animal feed has been long considered to be not palatable, causing weight loss, low in digestibility, have a low metabolizable energy and therefore a low nutritive value [8].

The Olive Feed Corporation was founded based on discovering a proprietary cooking process that transforms Olive Waste into a commercially viable animal feed by solving palatability, digestibility and safety problems previously associated with using Olive Waste as an animal Feed. The Company not only desired to find an alternative method for the disposal of Olive Waste, but to take advantage of the many beneficial nutrients and compounds found in Olives and produce not just an animal feed but an animal feed that could greatly elevate meat quality, improve the health of both the animal and meat consumer and provide increased revenue throughout the value chain of meat production.

In order to do this The Olive Feed Corporation performed tests internally on cattle purchased by the company while also testing on 3 Third Party farms in 3 different countries across a different pedigree of animals to establish conclusive results.

## Methods

In Edenderry, Ireland a test was performed using F1 Wagyu Angus Cattle, with two cattle of similar genetics tested side by side for a 4 month feeding period with the feeding plan provided in Figure 1. One

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steer was fed on a diet that was supplemented with Olive Feed and the other steer was not.

In Putten, Holland 7 Fullblood Wagyu Cattle were fed with an Olive Feed supplement for a 4 month feeding period using the feeding plan provided in Figure 1 vs a control group. In Sud Tirol Italy 3 Fullblood Wagyu Cattle were fed with an Olive Feed supplement for a 4 month period using the feeding plan provided in Figure 1 vs a control group. In California 25 Fullblood Wagyu cattle were fed with an Olive Feed supplement for a 4 month period using the feeding plan provided in Figure 1 vs a control group.

In Ireland Laboratory analysis was conducted by a third party to analyze the final meat produced for Oleic Acid Content, Glutamic Acid, Monounsaturated Fats and Carnosine. In Holland, weight gain and marble score analysis was performed as well as an evaluation of the cost of Olive Feed vs revenue achieved of Olive Fed Beef compared to previous production. In Italy, blind taste tests were conducted involving Michelin Star chefs, and leading European Wagyu Beef distributors. A total of 10 individuals performed the tasting, all of who are experienced culinary experts, particularly in the expertise of Wagyu Beef. In California overall feed composition analysis, marble score analysis, along with blind taste and texture tests were completed. In this case, existing customers familiar with the flavor and texture profile of the farms meat produced without Olive Feed were chosen to perform the taste test, and compare flavour and texture in comparison with the farms Olive Fed Wagyu. A total of 10 customers were chosen.

On the Irish Farm meat samples were sent to ALS Life Sciences Laboratory for Analysis of Oleic Acid, Glutamic Acid, Carnosine and Monounsaturated Fats with the results displayed in Figures 1 and 2. The cattle were fed on a diet of Maize, Rolled Barley, and Straw, with Olive Feed substituted for Barley in the Olive Fed steer.

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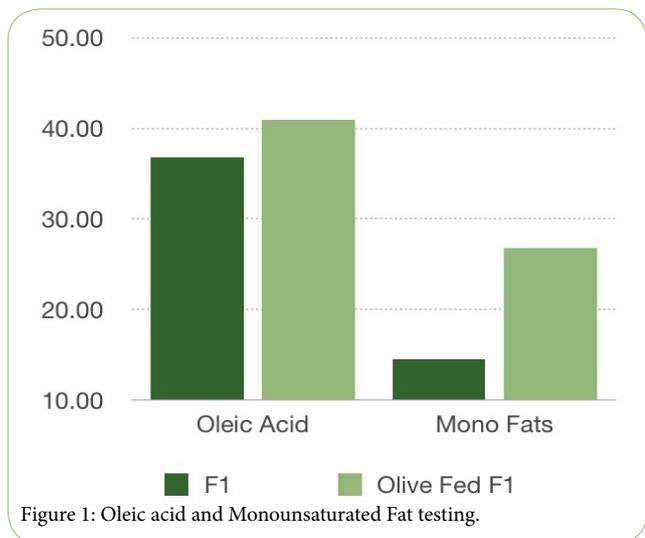


Figure 1: Oleic acid and Monounsaturated Fat testing.

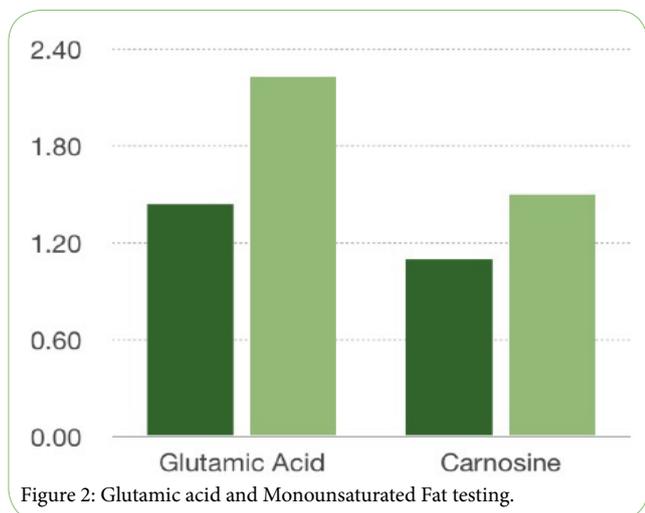


Figure 2: Glutamic acid and Monounsaturated Fat testing.

In Holland the cattle were firstly measured for weight gain. Over the 4 month period the Olive Fed Cattle consumed a greater quantity of food overall, with an estimated weight gain of 1.1kgs per day vs 1kg per day for the non Olive Fed cattle. The cattle were fed a fix mix of Corn, Wheat, Soybean and Barley with Olive Feed substituted for Barley in the Olive Fed cattle.

Marble score was analysed based on the Japanese Marbling Score system for Wagyu cattle [9] Control group marble scores were consistently marked as a 6 on the marbling score system, while the Olive Fed Cattle averaged an 8 marble score.

A revenue comparison was also conducted comparing the selling price of the Olive Fed Cattle at €5300 average per animal, vs €4300 average per animal for the control group giving a 23% increase in revenue for the farmer for the Olive Fed animals.

In Italy, 10 blind taste tests were conducted by the Wagyu Sud Tirol Farm owner using experienced chefs including Michelin Star graded chefs, and experienced Wagyu consumers. The blind tastings consisted of Olive Fed Wagyu vs Grain Fed Wagyu vs Grass Fed Wagyu. On each of the [10] blind tasting tests the Olive Fed Wagyu was chosen for its superior Taste, Texture and Tenderness.

The cattle in Italy were fed on various diets. The grass fed Wagyu was fed solely with grass. The Grain fed Wagyu was fed with a mixture of Corn, Distillers Grain, Beer, and Bread. The Olive Fed Wagyu was fed with a mixture of Corn, Distillers Grain, Beer, Bread and Olive Feed.

In California, 25 Fullblood cattle were fed on a mixture of Olive Feed, grass and a high carbohydrate pellet to mix with the Olive Feed vs a control group solely fed on grass. 24 of the 25 Olive Fed cattle were graded as “Prime+” on the US grading scale. 12 taste tests were conducted with the Olive Fed meat compared to the solely grass fed meat. On each taste test the Olive Fed meat was chosen as superior for having a better flavour, texture and tenderness than the solely grass fed meat.

Day	Month 1	Month 2	Month 3	Month 4
1	0.5kg	1.5kg	2kg	2.5kg
2	0.5kg	1.5kg	2kg	2.5kg
3	0.5kg	1.5kg	2kg	2.5kg
4	0.5kg	1.5kg	2kg	2.5kg
5	0.5kg	1.5kg	2kg	2.5kg
6	0.5kg	1.5kg	2kg	2.5kg
7	0.5kg	1.5kg	2kg	2.5kg
8	0.5kg	1.5kg	2kg	2.5kg
9	0.5kg	1.5kg	2kg	2.5kg
10	0.5kg	1.5kg	2kg	2.5kg
11	0.5kg	1.5kg	2kg	2.5kg
12	0.5kg	1.5kg	2kg	2.5kg
13	0.5kg	1.5kg	2kg	2.5kg
14	0.5kg	1.5kg	2kg	2.5kg
15	0.5kg	1.5kg	2kg	2.5kg
16	0.5kg	1.5kg	2kg	2.5kg
17	0.5kg	1.5kg	2kg	2.5kg
18	0.5kg	1.5kg	2kg	2.5kg
19	0.5kg	1.5kg	2kg	2.5kg
20	0.5kg	1.5kg	2kg	2.5kg
21	1kg	1.5kg	2kg	2.5kg
22	1kg	1.5kg	2kg	2.5kg
23	1kg	1.5kg	2kg	2.5kg
24	1kg	1.5kg	2kg	2.5kg
25	1kg	1.5kg	2kg	2.5kg
26	1kg	1.5kg	2kg	2.5kg
27	1kg	1.5kg	2kg	2.5kg
28	1kg	1.5kg	2kg	2.5kg
29	1kg	1.5kg	2kg	2.5kg
30	1kg	1.5kg	2kg	2.5kg

Figure 3: Olive Feed Consumption Per Day across all farms.

### Conclusions

Oleic Acid has been proven to lower the melting point of fat 10, so given the high marbling of fat in Wagyu meat to further lower melting point is a significant benefit and likely leads to the texture and tenderness improvements demonstrated. Glutamic acid has recently been shown as an important driver of Umami taste [11] and is an excitatory neurotransmitter [12]. It can be concluded that this is the key

improvement in flavour that led to the Olive Fed meat winning all of the taste tests. Monounsaturated Fat and Carnosine increases can be concluded as making the meat healthier for consumption and it could be concluded that the animal is healthier as a result of these nutrients being present in their meat.

These results alongside the improved revenue figures and potential for Olive Fed meats can be concluded as being a prime solution for the elimination of solid Olive Waste and the environmental and economic problems that arise from its production.

### Further Research

Based on research from the 1960's [13] the author has reason to believe the consumption of Olive Feed will also lead to significant Methane gas reduction from not only cattle but potentially a whole range of animals. Further investigation and a supported study using Olive Feed is required.

### Competing Interests

The authors declare that they have no competing interests.

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