BLACK SOLDIER FLY LARVAE MEAL AS A POTENTIAL PROTEIN SOURCE FOR POULTRY

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Issue: Price hike for chicken & eggs

HOME / MALAYSIA

Hike in livestock food component prices affects chicken prices, says minister

Friday, 10 Sep 2021 10:50 PM MYT

The Domestic Trade and Consumer Affairs Ministry in a statement yesterday said monitoring and inspection found an increase in the cost of the main ingredients to produce chicken feed, namely corn, soybeans and crude palm oil. — Picture by MIera Zulyana

NATION

Chicken farms in danger of closing due to price control extension, says group

3 Jan 2022 15:36

By TAN SIN CHOW

PETALING JAYA: The broiler and layer farm industry has expressed disappointment over the extension of the Malaysian Family Price Control Scheme to Feb 4 beyond Dec 31 as originally planned.

The Federation of Livestock Farmers' Associations of Malaysia said with the heavy pressure from ex-farm price controls on the broiler and egg industry,

NATION

Chicken ceiling price set at RM8.90 per kilo from Feb 5 to June 5

31 Jan 2022 18:28

By MAZWIN NIK ANIS

PUTRAJAYA: The ceiling price of standard chicken has been lowered by 20 sen, bringing it to RM8.90 per kg, and this price will be in effect for four months.

Prime Minister Datuk Seri Ismail Sabri Yaakob said the new ceiling price would be in effect from Feb 5 to June 5.

HOME / MALAYSIA

Report: Chicken farmers say facing RM200m losses per day with price ceiling, still no word on govt subsidy

Tuesday, 08 Feb 2022 09:13 AM MYT

BY RADZI RAZAK

People shop for fresh poultry at a market in Chow Kit, Kuala Lumpur February 3, 2022. — Picture by Firdaus Latif

Govt looking for mechanism to tackle price hike for chicken, eggs

Bernama

Januari 7, 2022 09:50 MYT

Alexander Nanta said prices for fresh chicken and eggs may go up after the Malaysian Family Maximum Price Control Scheme ends on Feb 4, but the government will find a mechanism to tackle it in the interest of all parties. - BERNAMA

JASIN: Prices for fresh chicken and chicken eggs may go up after the Malaysian Family Maximum Price Control Scheme ends on Feb 4, but the government will find a mechanism to tackle it in the interest of all parties.

Chicken feed: Prices of grain corn, soybean meals up by 13%, 11% since January

NATION

Saturday, 16 Apr 2022 8:57 PM MYT

KUALA LUMPUR: Prices of grain corn and soybean meals, the two main feed for chickens, have increased by 13% and 11%, respectively, since January.

The rise in the prices of chicken feed is one of the factors that contributed to the increase in the production cost for chickens, causing the prices of chicken in the country to re-escalate.

malaymail

Agriculture and Food Industries Ministry monitoring effects of Russia-Ukraine crisis on Malaysia's agrofood sector

Highlight

Govt agrees to subsidise 60 sen per kg for chickens, five sen per egg for poultry farmers

Bernama / Bernama

February 09, 2022 22:09 pm +08

Import ayam secara berterusan boleh jejas industri

Seriang: Langkah kerajaan mengimport ayam bulat sejuk beku untuk menstabilkan harga dan menjamin bekalan ayam di pasaran hanya sesuai untuk jangka pendek.

Pengarah Institut Pertanian Tropika dan Sekuriti Makanan (ITAFoS), Universiti Putra Malaysia (UPM), Prof Datuk Dr Zulkifli Idrus menyifatkan, langkah itu tidak sesuai dilaksanakan untuk jangka masa panjang kerana ia boleh menjejaskan industri pengeluaran ayam tempatan.

"Langkah kerajaan benarkan import ayam bulat ini satu tindakan yang baik, namun ia bersifat jangka masa pendek.

"Ini kerana, industri ayam di Malaysia sebenarnya sangat mantap dan jika kita berterusan import ayam, lama kelamaan kita bimbang ia akan jejaskan industri ayam negara ini," katanya pada sidang media di Bangunan Canselori Putra di sini, semalam.

Beliau berkata demikian bagi mengulas mengenai keputusan kerajaan tidak berhasrat menghentikan pengimportan ayam bulat dari luar untuk menampung kekurangan ayam dan menstabilkan harga ayam di Malaysia.

DR Zulkifli (kanan) bersama Dr M Nasir pada sidang media, semalam.

Mengulas lanjut, Dr Zulkifli berkata, isu kenaikan harga ayam di pasaran dijangka berlarutan sehingga tujuh bulan dan bakal berakhir hujung tahun ini.

Namun, kerajaan perlu bertindak segera bagi menyelesaikan isu ini untuk jangka masa panjang.

Sementara itu, mengulas langkah pengawalan harga ayam runcit RM8.90, Pensyarah Jabatan Perniagaan-tani dan Ekonomi Biosumber, UPM Prof Datuk Dr M Nasir Shamsudin berpandangan, langkah itu juga bagus namun perlu bersifat sementara sahaja.

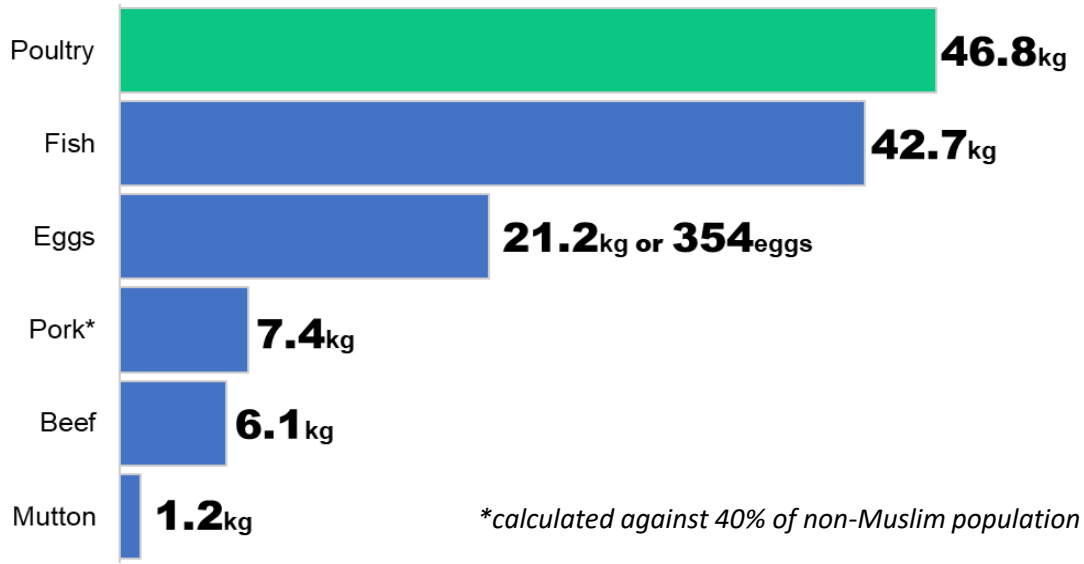
"Tak boleh kawal harga ayam secara berterusan kerana ia akan memberi kesan negatif kepada industri pengeluaran ayam," katanya.

THE STRAITS TIMES ASIA

Malaysia to stop exporting 3.6 million chickens a month from June 1

Rate of poultry consumption in Malaysia

Per capita consumption, 2020



**calculated against 40% of non-Muslim population*

Source: Fisheries Development Authority of Malaysia & Department of Veterinary Services

Top 10 poultry meat consumers (kg/per capita)

1.	Israel	65.4
2.	United States	50.9
3.	Malaysia	50.1
4.	Peru	47.4
5.	Australia	44.5
6.	Brazil	40.7
7.	New Zealand	40.1
8.	Argentina	38.2
9.	Chile	37.7
10.	Canada	36.1

Source: OECD FAO Agricultural Outlook Edition 2021, 2022 estimates

1. **On average, an individual consumes nearly 50kg of chicken meat and 370 eggs a year. (2020: 46.8kg & 354eggs)**

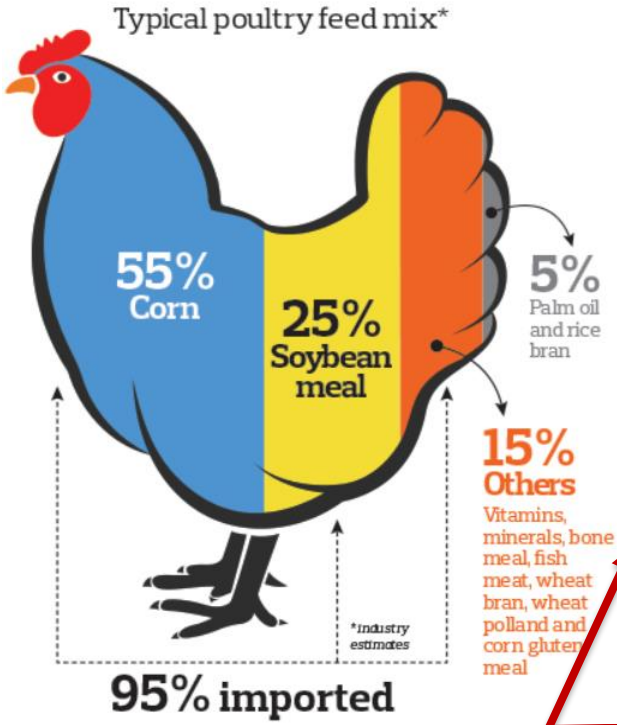
2. **Globally, Malaysia ranked 3rd as the top consumer per capita of chicken meat (2022 estimates: 50.1 kg/capita).**

3. **The rising cost of chicken meat largely impacts the *Rakyat* since the poultry industry supplies the cheapest source of protein which is preferred by most Malaysians.**

Malaysia self-sufficiency level in poultry is threatened

However, the poultry industry is very vulnerable because of its large dependence on imported feed grain, mainly corn and soybean meal & the rising feed cost has impacted a price hike for chicken meat.

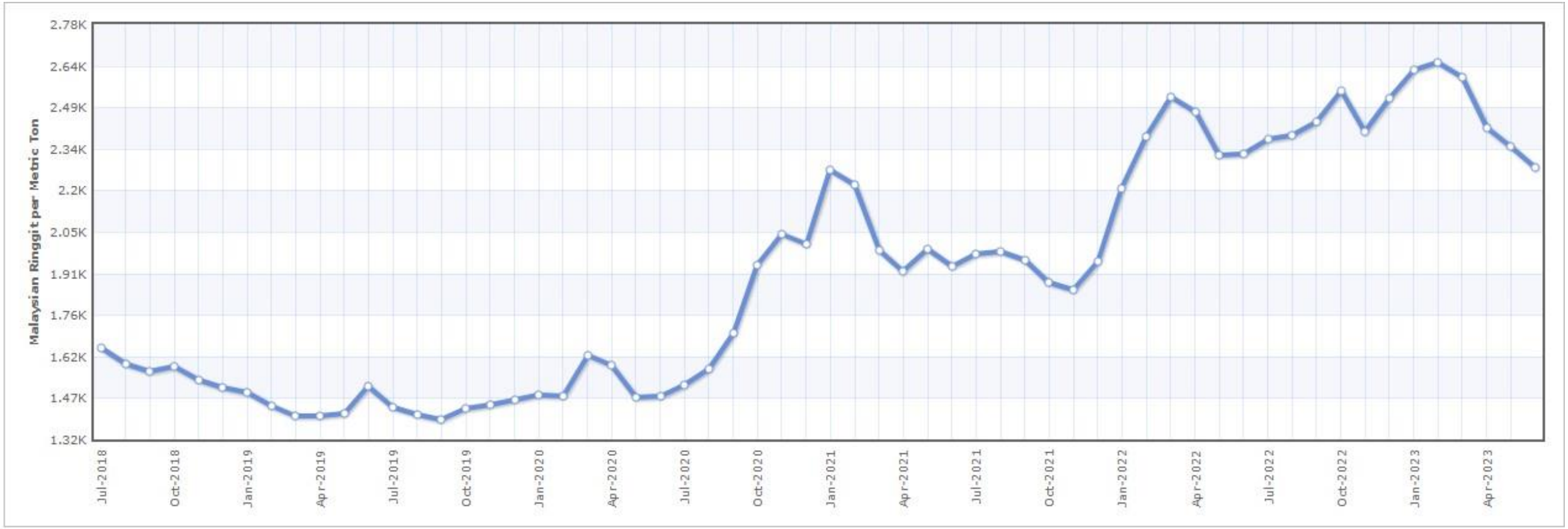
Composition of poultry feed mix & proportion of production cost of broiler in Malaysia



Cost of broiler production in Malaysia	
Variable cost	%
Day-old chick	18.52
Labour	4.20
Medication & vaccines	1.23
Utility	2.47
Maintenance	0.74
Feed cost	70.86
Catcher cost	0.99
Transport	0.99
Total	100

i. **95%** of poultry feed mix are **imported**
ii. Feed material contributes to more than **70%** of the **production cost**

THE PRICE OF SOYA BEAN MEAL – RINGGIT MALAYSIA PER TON METRIC (JULY 2018-JUNE 2023)

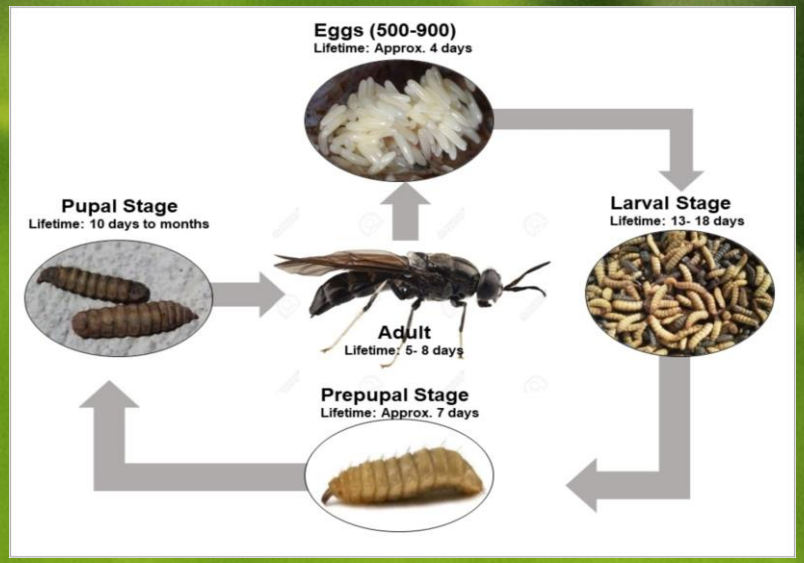


In 2021, Malaysia imported $570M in Soybean Meal, becoming the 16th largest importer of Soybean Meal.

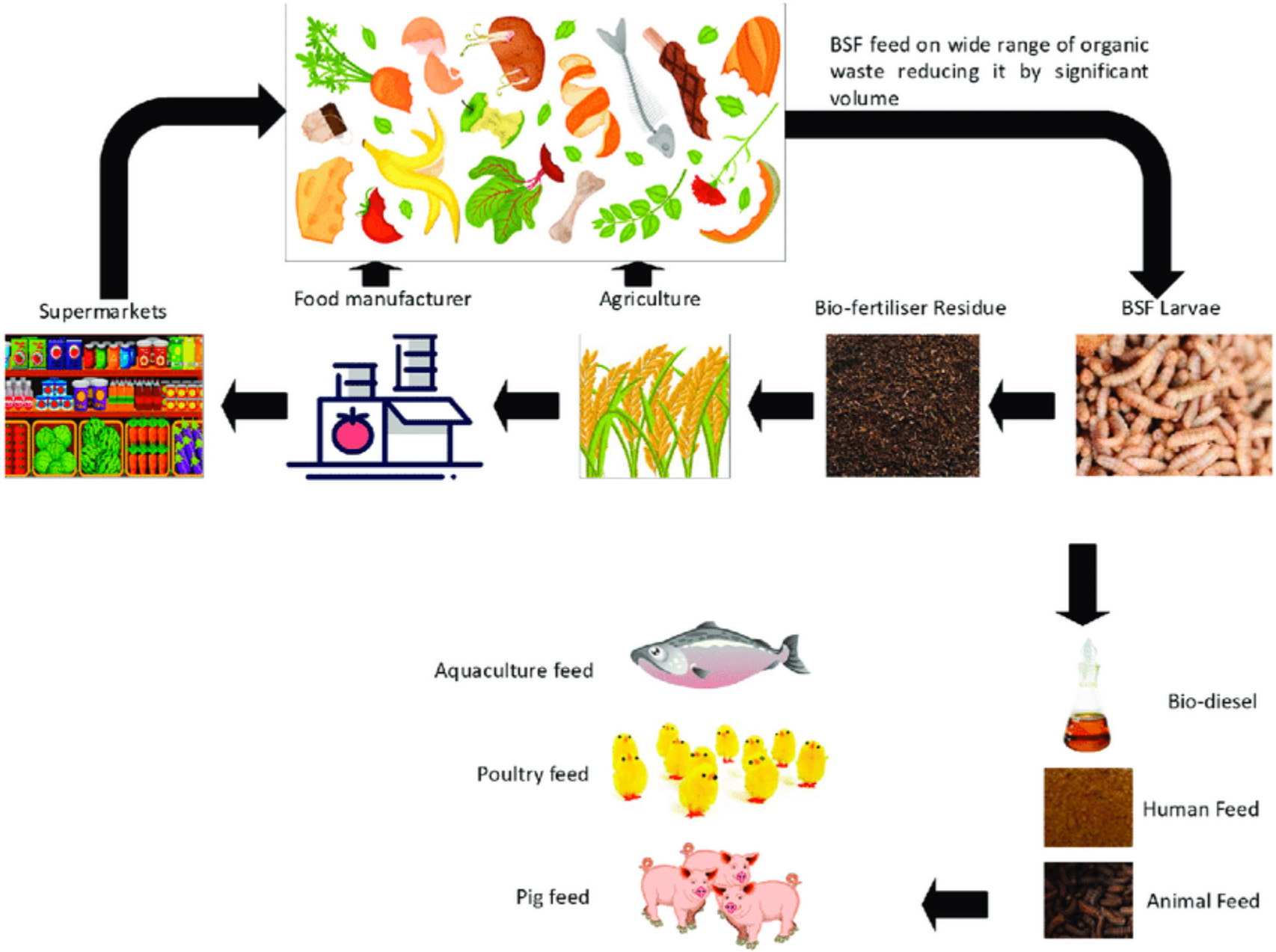
Source: Index Mundi 2023

Can we replace soybean meal in poultry feed?

Black soldier fly (*Hemertia illucens*)



- Insects are highly suitable to be used as feed due to their high nutritional values, and because they are naturally a part of poultry diets.
- Insect feed is a sustainable addition to conventional feed, as insects are reared on waste streams and can drive the CIRCULAR ECONOMY
- BLACK SOLDIER FLY IS NOT A VECTOR OF DISEASES



(Jagtap et al., 2021)

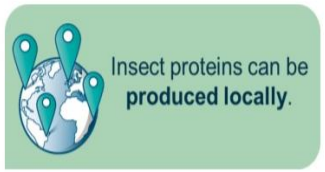
What is the protein feedstuff of the future?

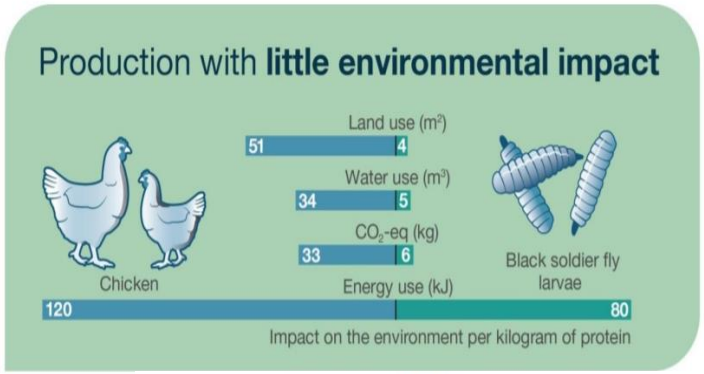
Black Soldier Fly Larvae (BSFL)

Black soldier fly

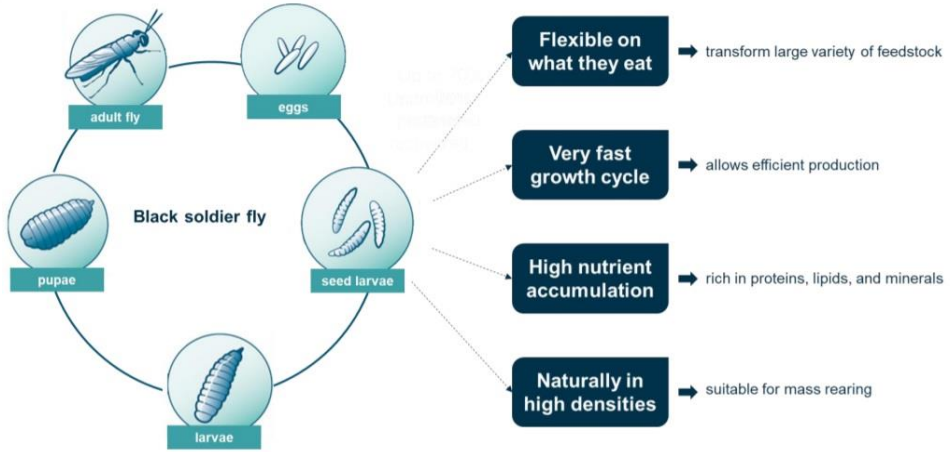
Black soldier fly larvae

Role of insects in the circular economy has far reaching potential





1kg of BSF eggs grows to 6 tons of live larvae in 12 days → super bioconverter



BLACK SOLDIER FLY LARVAE MEAL

- Black soldier fly larvae meal (BSFLM) has been proposed as a high-quality, efficient, sustainable alternative poultry protein source.

- Previous work in Europe and North America showed that BSF larvae, on average, contain both a high protein and fat content (Schiavone et al., 2017; Mwaniki and Kiari, 2019), the body composition of the larvae depends on the quality and quantity of food ingested (Newton et al., 2005; Nguyen et al., 2015).

- Information on the nutritional content and digestibility of **locally produced BSFL meals** is needed for diet formulation.

OBJECTIVE

To determine the proximate composition, amino acid profile, microbiological quality, heavy metal concentration and aflatoxin analysis of BSFL meal from various local sources

METHODOLOGY

The BSFL meal samples were collected from six local producers, as shown in Table 1 (arranged according to alphabetical order). The samples are identified as 1-6 for confidentiality, not according to the order in Table 1.

Table 1: The source of black soldier fly larvae meal samples

Producers	**Location**
Bioloop Sdn Bhd	Teluk Intan, Perak
Entomal	Klang, Selangor
Life Origin	Seri Kembangan, Selangor
Nutrition Technologies Sdn Bhd	Iskandar Puteri, Johor
Protenga Sdn Bhd	Senai Airport City, Johor
Veolia Bioconversion Malaysia	Bestari Jaya, Selangor

METHODOLOGY (cont'd)

Proximate analysis: The Kjeldahl method determined crude protein (CP) using an automatic system (Kjeltec 2300). Crude fat (CF) was gravimetrically measured by the ether extraction method in a soxhlet extraction unit (Soxtec 2043). Crude ash content was determined as the residue remaining after the incineration of samples at 550˚C in a muffle furnace for 6 hours. Dry matter was quantified by the thermogravimetric method using an oven by drying samples at 105˚C until constant weight (AOAC, 1990).

Amino acid analysis: The samples were subjected to hydrolysis using hydrochloric acid under total hydrolysis conditions. A small amount of the amino acid solution was then derivatised with AccQ-Fluor Reagent and aminobutyric acid as the internal standard. The amino acid derivatives were analysed using HPLC (Waters–Alliance e2695) with Fluorescence detector (2475-waters). The amount of amino acid (ng) was determined by external standard calibration with aminobutyric acid (AABA) to compensate for variation in derivatisation between the samples.

Heavy metal analysis: The concentration of heavy metals was analysed via Inductively Coupled Plasma Mass Spectrometry (ICP-MS).

Microbiological quality analysis: Detections and counts of Enterobacteriaceae, total coliform, Clostridium botulinum, Salmonella spp., and Listeria monocytogenes were carried out according to Oteri et al. (2021).

Table 2: Proximate composition of soybean meal and black soldier fly larvae meal from various local producers (% DM).

	Sample						
Proximate analysis	SBM	BSFL 1	BSFL 2	BSFL 3	BSFL 4	BSFL 5	BSFL 6
Total Ash (g/100g)	6.40	6.20	11.00	21.10	16.00	11.50	10.80
Dry Matter (g/100g)	87.20	95.70	94.50	96.30	95.40	94.20	93.80
Protein (g/100g)	43.50	62.20	50.60	49.10	47.40	47.00	56.60
Crude Fat (g/100g)	1.10	6.90	10.50	5.80	14.70	15.40	10.50

SBM : soybean meal

- All six BSFL meal samples showed higher CP and CF concentrations than SBM.
- Crude protein of BSFL meal ranged from 47.00 – 62.20%
- Crude fat BSFL meal ranged from 5.80 – 15.40%

Table 3: Amino acid composition of soybean meal and black soldier fly larvae meal from various local producers (g/100g).

	Sample						
Amino acid	SBM	BSFL 1	BSFL 2	BSFL 3	BSFL 4	BSFL 5	BSFL 6
Lysine	2.752	4.593	3.042	3.045	3.298	2.864	16.51
Methionine	0.526	0.823	0.645	0.845	0.606	0.540	11.40
Cysteine	0.265	0.238	0.125	0.175	0.177	0.105	12.90
Isoleucine	1.831	4.404	1.775	2.040	1.667	1.505	1.49
Tryptophan	0.550	0.960	0.703	0.800	0.701	0.640	0.77
Valine	1.838	3.027	2.392	2.727	2.157	1.962	1.82
Threonine	2.555	3.338	2.166	3.028	2.027	1.795	1.66
Arginine	4.541	4.274	2.704	3.897	2.387	2.131	2.15
Histidine	3.059	5.104	3.064	3.785	2.929	2.736	1.33
Leucine	3.175	3.787	2.968	3.458	2.734	2.482	2.64
Phenylalanine	1.995	1.937	1.384	1.948	1.331	1.172	1.76
Aspartic acid	5.935	7.609	6.931	5.837	6.814	6.086	2.42
Alanine	1.522	3.565	2.833	2.776	2.717	2.312	2.23
Glutamic acid	13.082	11.238	11.601	9.564	9.507	5.929	3.05
Glycine	1.488	2.174	1.727	2.127	1.547	1.457	1.68
Proline	2.235	3.492	2.591	2.761	2.508	2.219	2.35
Serine	3.776	4.022	2.699	3.890	2.533	2.294	1.80
Tyrosine	1.211	2.974	1.949	2.928	1.923	1.693	2.40

SBM: soybean meal

- Lysine, methionine, and threonine are major limiting essential amino acids in cereal-based diets for poultry.
- Generally, BSFL meal has high levels of essential amino acids and has a better amino acid profile than the soya bean meal.
- In the present study, all six BSFL meals have higher methionine and lysine contents than SBM.

Table 4: Heavy metal composition of soybean meal and black soldier fly larvae meal from various local producers (mg/kg).

	Sample								
Heavy metal	SBM	BSFL 1	BSFL 2	BSFL 3	BSFL 4	BSFL 5	BSFL 6	Rejection limit	Source
Arsenic	1.072	1.947	1.423	2.830	1.724	1.958	0.614	2 mg/kg	Commission Regulation (EU) No 2015/186 2019/1869 amending Annex I to Directive 2002/32/EC
Cadmium	0.039	0.155	0.103	0.431	0.165	0.152	0.219	2 mg/kg	Commission Regulation (EU) No 1275/2013 amending Annex I to Directive 2002/32/EC
Plumbum/ Lead	0.249	0.264	0.483	2.128	0.696	0.556	0.369	10 mg/kg	Commission Regulation (EU) No 2017/2229 2019/1869 amending Annex I to Directive 2002/32/EC
Mercury	0.019	0.037	0.023	0.022	0.061	0.047	0.061	0.1mg/kg	Commission Regulation (EU) No 2017/2229 2019/1869 amending Annex I to Directive 2002/32/EC
Chromium	1.473	2.044	2.780	8.572	3.732	5.079	6.856	200 mg	

SBM: soybean meal

- The levels of heavy metals remained below EU limits suggested for feed materials (EC, 2002) and foodstuffs (EC, 2006).
- The findings indicate that the BSFL provided feedstocks without heavy metals or exceeding the maximum allowable limits.

Table 5: Microbial counts of soybean meal and black soldier fly larvae meal from various local producers (cfu/g)

	Sample								
Bacteria	SBM	BSFL 1	BSFL 2	BSFL 3	BSFL 4	BSFL 5	BSFL 6	Acceptable limit	Source
Enterobacteriaceae (CFU/g)	20	25	<10	<10	<10	<10	<10	300 /g	Commission Regulation (EU) 142/2011, annex X, chapter 1
Total Coliform (CFU/g)	<10	<10	<10	<10	<10	<10	<10		
Clastridium botulinum in 1g	ND	ND	ND	ND	ND	ND	ND		
Salmonella spp. in 25g	ND	ND	ND	ND	ND	ND	ND	0+% 20 (approaching 0%)	GMP+
Listeria monocytogenes in 25g	ND	ND	ND	ND	ND	ND	ND		

ND : not detected
SBM : soybean meal

- Only Enterobacteriaceae and Coliform were noted in the present study, but the load is within the acceptable limit of 300 CFU/g.

Table 6: Aflatoxin analysis of soybean meal and black soldier fly larvae meal from various local producers (pbb)

	Sample						
	SBM	BSFL 1	BSFL 2	BSFL 3	BSFL 4	BSFL 5	BSFL 6
Aflatoxin B1	5.459	ND (<1)	ND (<1)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
Aflatoxins B2	8.691	ND (<1)	ND (<1)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
Aflatoxins G1	ND	ND (<1)	ND (<1)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
Aflatoxins G2	ND	ND (<1)	ND (<1)	ND (<1)	ND (<1)	ND (<1)	ND (<1)

ND : not detected
SBM : soybean meal

Rejection limit: ≥20 ppb
(Commission Regulation (EU) No 574/2011 amending Annex I to Directive 2002/32/EC)

Table 7: Apparent ileal digestibility coefficients (AIDC) of amino acids of soybean (US Soybean Export Council) and black soldier fly larvae (Schiavone et al., 2017) meals for broiler chickens

Amino acid	SBM	BSFL
Lysine	0.86	0.80
Methionine	0.87	0.78
Cysteine	0.79	0.45
Isoleucine	0.86	0.87
Tryptophan	0.92	0.96
Valine	0.86	0.91
Threonine	0.84	0.77
Arginine	0.92	0.80
Histidine	0.88	0.63
Leucine	0.87	0.89
Phenylalanine	0.88	0.86
Aspartic acid	0.85	0.80
Alanine	0.86	0.99
Glutamic acid	0.88	0.65
Glycine	0.84	0.65
Proline	0.87	0.82
Serine	0.86	0.77
Tyrosine	0.92	0.95

CONCLUSIONS

- The locally produced BSFL meals, based on their nutrient content, represent a novel and promising feed ingredient for poultry diets and could be used as a substitution ingredient for soybean in layer or broiler diets.

- Variations in nutrient content.

- The locally produced BSFL meals are safe from pathogens, heavy metal contamination and aflatoxin.

- The apparent nutrient digestibility, metabolisable energy and apparent ileal amino acid digestibility of local BSFL meals are currently been determined. The matrix values of local BSFL meals are critical before applying them in feed formulations.

ACKNOWLEDGEMENTS

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Thank
You