Soyabean	3.18	7.1	801.4	30	2.4	0.5	Free Flowing, Abrasive and Contain Explosive Dust
Corn Bran	3.18	6.70	448.8	30	2.4	0.5	Free Flowing, Abrasive and Contain Explosive Dust
Sorghum	3.18	7.1	512.9	30 - 45	2.1	0.6	Free Flowing, and Abrasive

(Mohsenin, 1986)

3. Results and Discussion

Table 2 presents the properties of granular material for the compoundment of good quality or homogeneous feeds, if it is correctly applied and Table 3 presents the properties of granular materials used for the compoundment of feed by the fabricated mixer.

Table 4 shows the cost of producing 250 Kg of starter's mash. The unit prices of the materials are stated. The market price of 250 Kg of starter' mash was 12,000 as against 7807.50.

Table 5 to 7 show the compoundment of grower's, finisher's and layer's mash and their prices per 250 Kg. The market prices of the feeds are 8600, 13,500 and 11,000 as against 5,388, 8,364.5 and 6,867.50 production cost.

Table 8 presents the proximate analysis of feed nutrients. Proximate analysis of feeds is the standard practical feed formula for poultry. It was found out that the laboratory determinations of the proximate analysis of produced feeds are in line with the standard. It was from the proximate analysis that each feed ration was compounded.

The compounded feeds were used as ration for 25 broilers, 35 cockerel and 26 layers day old chicks and they grew to maturity. This is to say that the compounded feeds are satisfactory. It could be deduced that the rate of mixing of the developed machine was efficient compared to the traditional method of mixing. The total time used for the mixing of 250 Kg of feed was 105 minutes ($1\frac{3}{4}$ hours) and it was used to calculate the amount of feed to be produced within a day, a week and a month with the developed machine. It could be deduced that the rate of mixing of the developed machine was efficient compared to the traditional method of mixing.

Table 3: Properties of granular materials used for the fabricated mixer

Materials	Maximum Particle Size (mm)	Moisture Content (%)	Bulk Density (Kg/m^3)	Angle of Repose (degree)	Fineness Modulus	Coefficient of Friction
Wheat offal	3.2	7.6	209	45	2.5	0.5
Maize	3.6	8.0	723	38	2.4	0.6
Groundnut Cake	12.9	7.5	648	33	2.4	0.6
Palm Kernel Cake	12.8	6.0	648	44	2.6	0.5
Bone meal	12.9	7.3	163	46	3.0	0.5
Salt	3.1	-	805	43	2.7	0.7
Soyabean	3.6	7.4	805	27	2.5	0.6

Table 4: 250 Kg of Starter's Mash Compoundment

Materials	Quantity(Kg)	Unit Price (#)	Total Price(#)
Wheat offal	65	15	975
Maize	87	28.02	2438
Soya bean meal	67	56	3752
Palm kernel cake	30	7	210
Methionine	0.25	800	200
Salt	1.25	26	32.50
Lysine	0.25	800	200
Total	250.75	1732.02	7,807.50

Table 5: 250 Kg of Grower's Mash Compoundment

Materials	Quantity (Kg)	Unit Price(#)	Total Price(#)
Wheat offal	53.6	15	804
Maize	53.6	28	1500.4
Groundnut cake	42.0	30	1260
Salt	1.35	26	35.1
Palm kernel cake	91.7	7	641.9
Bone meal	6.54	30	196.2
Lysine	0.25	800	200
Premix	1.25	440	550
Methionine	0.25	800	200
Total	250.54	2,176	5,388.00

Table 6: 250 Kg of Finisher's Mash Compoundment

Materials	Quantity(Kg)	Unit Price(#)	Total Price(#)
Maize	112.5	28	3150
Wheat offal	40	15	600
Soya bean meal	60	56	3360
Bone meal	10	30	300
Palm kernel cake	25	7	175
Lysine	0.295	800	236
Salt	1.25	26	32.5
Methionine	0.295	800	236
Premix	0.625	440	275
Total	250.00	2,202	8,364.5

Table 7: 250 Kg of Layer's Mash Compoundment

Materials	Quantity (Kg)	Unit Price(#)	Total Price(#)
Wheat offal	47.5	15	712.5
Soya bean meal	50	56	2800
Corn bran	87.5	20	1750
Groundnut cake	12.5	30	375
Lime stone	12.5	7	875
Methionine	0.25	800	200
Lysine	0.25	800	200
Salt	1.25	26	32.5
Premix	0.625	440	275
Palm kernel cake	30	7	210

Bone meal	7.5	30	225
Total	250.00	2,231	6,867.5

Table 8: Proximate Analysis of the Feed Nutrients

Nutrients (%)	Starter's Mash	Grower's Mash	Finisher's Mash	Layer's Mash
Crude protein	20	15.00	19.00	18.00
Crude fat/oil	5.40	3.40	3.10	3.20
Crude fibre	5.20	5.80	4.30	5.80
Vitamin	26.00	31.00	27.90	30.00
Minerals	3.60	4.00	3.30	5.00
Energy	38.70	36.80	40.80	36.80
Additives	3.10	4.00	1.60	2.00

4. Conclusion

The developed machine reduced the labour cost of mixing by 40 % and the time involved by 60 % for compounding 250 Kg of feed. Different type of feed formulation and the production cost were stated above to enable farmers produce feed at cheaper rate. Poultry feed mixer can be fabricated vertically or horizontally, but the horizontal type requires much power to vertical type. The fabricated machine is batch process of mixing and continuous mixing type can be fabricated using the same principle. The efficiency of the machine will reduce, if the calculated power is not used for its operation. It will also delay the rate of mixing and lead to poor quality of feed.

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