CROP RESIDUE YIELD BASED ON FAO CROP PRODUCTION REPORT IN NIGERIA

Abdulazeez A.
Federal College of Education (Technical) Gusau, Zamfara State, Nigeria.
Corresponding author:azeezrazaq70@gmail.com, +2348028502373

ABSTRACT
Food and Agriculture Organization (FAO, 2017) reported the yield of cowpea, maize, millet and rice in Nigeria for the years 2009, 2010 and 2015. Based on the reports, the conversion factors proposed by Kossila (1983) were used to determine the quantity of crop residues derived nationally from the areas cultivated. It was established that cowpea, maize, millet and rice yielded 6.49, 19.59, 9.68 and 8.64 (million tons) crop residues respectively in Nigeria for the years reported**.**

Keywords: Cowpea, maize, millet, rice, crop residue

INTRODUCTION
According to World Bank Development Indicators (WDI, 2018), agriculture is an important sector of Nigeria's economy, contributing about 21.2 percent to gross domestic product (GDP) and 36.5 percent to employment. Industry and services contribute around 18 and 60 percent to GDP, respectively, the two sectors employing about 12 and 52 percent of the labor force, in that order (World Bank, 2018). The country's agricultural sector is heterogeneous, comprising small through medium to large farmers and farms with different levels of efficiency. According to the report, smallholders, however, dominate the agricultural and livestock production landscape. They mainly cultivate rice, maize, sorghum, millet, cassava, and also keep cattle, small ruminants and poultry (WDI, 2018). Nigeria has 70.8 million ha of agricultural land, of which 37 million ha are arable (FAOSTAT, 2018).
Federal Ministry of Agriculture and Rural Development (FMARD, 2017) reports that livestock sector contributes around 1.7 percent to the national GDP and around 9 percent to the agriculture value added. Recent estimates indicate that Nigeria's national herd comprises 18.4 million cattle, 43.4 million sheep, 76 million goats and 180 million poultry. Report from National Livestock Transformation Plan (NLTP, 2019) shows that importation of food amounts up to 3-5 billion USD per year, out of which milk accounts for 1.3 billion USD. Including net trade, the per capita food supply of animal source foods is 8 litres of milk, 9 kg of meat and 3.5 kg or 55 eggs per year. According to FAOSTAT, (2019) consumption levels of milk and meat are lower than the continental averages that are 44 litres and 19 kg, respectively.
It has been projected that the African population would jump from its current 1.2 billion to 2.5 billion and that the urban population would increase from its present 40% to 50% (UN, 2017 and 2018). It has also been projected that the current gross domestic product of USD 4.3 trillion would almost triple in the year 2050 leading to improved purchasing power of consumers in Africa (FAO,2018). The impact of the improved purchasing power would translate to higher demands for agricultural products such as meat, milk and other livestock products thereby leading to increase in agricultural production activities (Swarth, 2011). When there are increase in agricultural activities, there would be more competition between man and livestock for feed, therefore there is need to explore another alternative source of feed for livestock such as crop residues to complement other expensive feedstuff in order to meet their nutrient requirements.
Unlike developed nations where livestock farming is grain-based, developing African countries that are struggling to feed their teeming population cannot afford to feed livestock with grains. The available option however is to use crop residues which are by-products of cereals after harvest. The major disadvantage of these crop residues, however, is that they are low in nutritive values hence resulting in poor digestibility.
Latham (1997) reported that the word crop 'residue' is misleading as it implies that vegetative parts, straws and stover left in the field after harvest are not useful. This assertion is obvious since most farmers burnt or disposed them off. The value of crop residue is becoming popular these days as feed for animals due to depletion of the rangelands occasioned by new human settlements as their

population grow. However, global demand for grains and legumes for both human and animal consumption has led to availability of abundant crop residues. Just like in other countries, Nigeria also produces lots of crop residues at the end of the planting season. Unlike other agricultural by-products, crop residues are characterized by poor digestibility due to their cell structures. The aim of this review was to update the data on the quantity of crop residues derived from cowpea, maize, millet and rice in Nigeria based on the FAO (2017) crop production reports for the years 2009 – 2015.

Crop Residues Supplies in West Africa

FAO (2014) reported that straw supplies in West Africa are larger than haulm or peel and that there was a reduction in the quantity of available cereal residues per animal from legume haulm while peel remains constant. It reported that increased legume production with haulm having 45% increase compared to 25% for straw was attributed to increased groundnut production. The report also indicated that crop residues from cereal production dropped from 91% to 88% in 2009 while that from legumes increased from 6% to 9%. The report further highlighted that the quantity of straw per animal has increased in all the sub-humid countries except for Guinea Bissau while it decreased in most Sahelian countries. It has also been reported that peels have increased in countries producing yam and cassava (FAO, 2014).

The largest quantity of crop residues is from millet and sorghum but their share in the total residue considered have diminished as other straws tend to stagnate while the quantity of straw supply per TLU for maize and rice has increased slightly (FAO, 2014). As for haulms, supply per animal has increased for groundnut while it has remained constant for cowpea; however, increase in peel supply per animal in the sub-humid countries is remarkable but relatively stable at regional level (FAO, 2014).

MATERIAL AND METHODS

Data from FAO (2017) crop production report in Nigeria for the years 2009, 2010 and 2015 on cowpea, maize, millet and rice cultivation was adopted. The various crop residue yield were then determined in Excel using the conversion factors proposed by Kossila (1983).

Results and Discussion

Tables 1 – 4 show the yield from cowpea, maize, millet and rice in Nigeria for the year 2009 – 2015 (FAO, 2017) and the derived crop residues using the conversion factor of Kossila, (1983). According to FAO (2017), cowpea yield (ton/ha) for the year 2009, 2010 and 2015 were 1, 1.2 and 0.6 respectively while the cowpea haulm derived were 0.8, 0.92 and 0.49 respectively. A total of 6.49 million tons of cowpea haulm was produced nationwide for the reported years (Table 1).

Table 1: Cowpea and haulm production in Nigeria

Parameters	**Year of production**		
	2009	**2010**	**2015**
Crop yield (ton/ha)	1	1.2	0.6
Cowpea haulm yield (ton/ha)	0.82	0.92	0.49
Area harvested (Million ha)	2.3	2.9	3.6
Cowpea haulm from area harvested (Million ton)	1.89	2.84	1.76

Source: FAO (2017), Conversion factor: Kossila (1983)

Maize yield (ton/ha) for the year 2009, 2010, and 2015 were 2.2, 1.9 and 1.6 (FAO, 2017) respectively while the derived crop residues for the years were 1.65, 1.43 and 1.2 respectively. A total of 19.59 million tons of crop residues was produced in the years reported (Table 2).

Table 2: Maize and crop residue production in Nigeria

Parameters	**Year of production**		
	2009	**2010**	**2015**
Crop yield (ton/ha)	2.2	1.9	1.6

Crop residue yield (ton/ha)	1.65	1.43	1.2
Area harvested (Million ha)	3.4	4.1	6.8
Crop residues from area harvested (Million ton)	5.61	5.82	8.16

Source: FAO (2017), Conversion factor: Kossila (1983)

Millet yield (ton/ha) for the years 2009, 2010 and 2015 were 1.30, 1.20, and 0.90 respectively (FAO, 2017) while the derived crop residues were 1.08, 1.00 and 0.75 respectively. A total of 9.68 million tons of crop residues was produced for the years reported (Table 3). Table 3: Millet and crop residue production in Nigeria.

Parameters	**Year of production**		
	2009	**2010**	**2015**
Crop yield (ton/ha)	1.30	1.20	0.90
Crop residue yield (ton/ha)	1.08	1.00	0.75
Area harvested (Million ha)	3.80	4.40	1.60
Crop residues from area harvested (Million ton)	4.10	4.38	1.20

Source: FAO (2017), Conversion factor: Kossila (1983)

FAO (2017) report indicated that in the year 2009, 2010 and 2015, the yield (ton/ha) were 1.9. 1.8 and 2.00 respectively while the straw yield for the same years were 1.20, 1.15 and 1.20 respectively. A total of 8.64 million tons of straw was derived for the reported years (Table 4).

Table 4: Rice and straw production in Nigeria

Parameters	**Year of production**		
	2009	**2010**	**2015**
Crop yield (ton/ha)	1.90	1.80	2.00
Rice straw yield (ton/ha)	1.20	1.15	1.20
Area harvested (Million ha)	1.80	2.40	3.10
Rice straw from area harvested (Million ton)	2.16	2.76	3.72

Source: FAO (2017), Conversion factor: Kossila (1983)

CONCLUSION

It has been established based on FAO (2017) crop production report for the years 2009, 2010 and 2015, that cowpea, maize, millet and rice yielded6.49, 19.59, 9.68 and 8.64 (million tons) crop residues respectively in Nigeria for the years reported**.** This report shows that there are abundant crop residues in Nigeria that can be utilized in livestock feeding especially during the dry season when feeds are scarce in order to avert livestock feed crises.

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