

Assessment of livestock components in crop-livestock production systems in Ido Local Government Area of Oyo State, Nigeria

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The contribution of livestock in the livelihood activities to the farmers' household income is critical to food security in Nigeria. Against there is a paucity of information on the assessment of livestock components in integration production systems. The study tries to investigate the livestock component in the crop-livestock production system in Ido Local Government Area (LGA) of Oyo State. A multi-stage sampling technique was used to elicit information from purposively selected 225 respondents with the Participatory Rural Appraisal method. Parameters measured were biodata, wealth status, average livestock holding/household (TLU), seasonality. Qualitative and quantitative data collected through questionnaire were transcribed into the Feed Assessment Tool (FEAST) Excel macro program (www.ilri.org/feast) and were analyzed with descriptive statistics. The respondents' categories (%) landless, small, medium and large scale were 10, 42, 30, and 18, respectively. The average livestock holding/household (TLU) values were 0.08, 0.33, 0.37, 4.96, 5.68, 14.40, 28.80, and 67.68 poultry, sheep, goat, indigenous (female dairy calves, male calves, dairy heifers, dairy lactating cows, and dry dairy cows), respectively. The average livestock species holding/household values of 121.53, 10.50, 5.00, and 15.20 for indigenous dairy cattle, WAD goat, WAD sheep, and indigenous poultry, respectively. The average area of land put to the cultivation of these fodders was 8.80, 2.40, 0.80, 0.80, 0.40, and 0.30, respectively. The contribution of livelihood activities to household income (%) was livestock (60), agriculture (20), business (10), remittances (5), labor (3), and others (2). It can be concluded that since Ido LGA is an oasis for crop and livestock production enterprises due to the available quality and quantity of feed resources -FEAST can assist the government in policy formulation.

Keywords: Feed resources, FEAST, fodder crops, income, integrated farming

Une Évaluation des composantes de l'élevage dans les systèmes de production de cultures et d'élevage dans la zone de gouvernement local d'Ido de l'État d'Oyo, Nigéria

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Résumé

La contribution du bétail aux activités de subsistance au revenu des ménages des agriculteurs est essentielle à la sécurité alimentaire au Nigéria. Par contre, il y a un manque d'informations sur l'évaluation des composants de l'élevage dans les systèmes de production d'intégration. L'étude tente d'étudier la composante élevage dans le système de production de cultures et de bétail dans la zone de gouvernement local d'Ido (le 'LGA') de l'État d'Oyo. Une technique d'échantillonnage à plusieurs degrés a été utilisée pour obtenir des

informations auprès de 225 répondants sélectionnés à dessein avec la méthode d'évaluation rurale participative. Les paramètres mesurés étaient les données biologiques, l'état de richesse, la moyenne des exploitations / ménages, la saisonnalité. Les données qualitatives et quantitatives collectées par le biais du questionnaire ont été transcrites dans le programme macro Excel de l'Outil d'évaluation de l'alimentation (le 'FEAST') (www.ilri.org/feast) et ont été analysées avec des statistiques descriptives. L'échelle était de 10, 42, 30 et 18, respectivement. Les valeurs moyennes des exploitations / ménages étaient de 0,08, 0,33, 0,37, 4,96, 5,68, 14,40, 28,80 et 67,68 volailles, ovins, caprins, indigènes (veaux laitiers femelles, veaux mâles, génisses laitières, vaches laitières en lactation, et vaches laitières séchées), respectivement. Les valeurs moyennes des espèces d'élevage / ménage sont respectivement de 121,53, 10,50, 5,00 et 15,20 pour les bovins laitiers indigènes, les chèvres WAD, les moutons WAD et la volaille indigène. La superficie moyenne des terres consacrée à la culture de ces fourrages était de 8,80, 2,40, 0,80, 0,80, 0,40 et 0,30, respectivement. La contribution des activités de subsistance au revenu des ménages (%) était l'élevage (60), l'agriculture (20), les affaires (10), les envois de fonds (5), la main-d'œuvre (3) et autres (2). On peut en conclure que puisque la zone de gouvernement local d'Ido est une oasis pour les entreprises de production agricole et animale en raison de la qualité et de la quantité disponibles des ressources fourragères –le FEAST peut aider le gouvernement dans la formulation des politiques.

Mots clés : ressources fourragères, FÊTE, cultures fourragères, revenus, agriculture intégrée

Introduction

The role of livestock production enterprises in the income capacity of farmers' household income is underestimated in sub-Saharan Africa. Many had opined that animal husbandry practices were regarded as a hobby rather than a business or money-making venture. Many workers had reported on the economic viability of livestock production enterprises to farmers' livelihood in sub-Saharan Africa. There is a paucity of information on the appraisal of livestock component in the crop-livestock production system. The study tries to assess the livestock components in crop-livestock production systems in Ido Local Government Area (LGA) of Oyo State, Nigeria. Crop-livestock production system (CLPS) is a system of production of crops and livestock simultaneously for mutual benefits. Many workers had reported the numerous benefits from the synergy of CLPS (Herrero et al 2010, Babayemi et al.,

2014, Sosina, 2017, Descheemaeker et al., 2017). The CLPS integration offers opportunities to promote organic agriculture; and carry-over of carbon and nutrients from one cropping season to the next (Ezeaku et al., 2015). Integration also enhances land productivity and improves water use efficiency (Mekuria and Mekonnen, 2018), minimize risks and insurance against crop failures (Sosina, 2017). An integrated modeling framework allows assessing the impact on livestock (Descheemaeker et al., 2017).

However, the significant role of the livestock component in the integration has also received tremendous attention worldwide. The livestock production enterprises sensitively contribute to the vulnerability of the smallholder system (Descheemaeker et al., 2017). It also provides coping strategies to farmers during vagaries climate change especially in the availability of feed resources in the

tropics (Sosina, 2017; Samiredypalle *et al.*, 2014). Furthermore, information on livestock is vital for the decision-making process (Sosina, 2017; Descheemaeker *et al.*, 2017) and intervention programs by relevant donor agencies (Babayemi *et al.*, 2014, FAO 2015, Sosina, 2020) and philanthropist. There is information on the development and use of a dynamic modeling framework integrating climate crop, pasture, and livestock models in Zimbabwe (Descheemaeker *et al.*, 2017). Furthermore, a cursory look at the impact of the livestock components in the CLPS synergy revealed other intrinsic benefits. Livestock production (among other farm activities) provides a wide range of responses or insurance to uncertain conditions or some unforeseen circumstances, increases both household and farm income (Kuria *et al.*, 2014, Sosina, 2020). Also, animal protein from livestock enterprise provides resilience to some disease and food security (FAO 2015, Sosina *et al.*, 2019, Samiredypalle *et al.*, 2014). Livestock component in CLPS also provides fuel, manure, draught power, off-springs, socio-cultural benefits, and animal traction (Mekuria and Mekonnen, 2018, Descheemaeker *et al.*, 2017, Ezeaku *et al.*, 2015). Livestock contributes about 10-15% of export earnings and 3.5% of the total gross domestic product to the national economy (ATA, FMANR 2013). Land degradation, food insecurity, and feed resources scarcity are still adversely affecting the livelihoods of farmers and landscape situations in Ethiopia (Kuria *et al.*, 2014; Mekuria and Mekonnen, 2018; Mekonnen *et al.*, 2017; Lulseged *et al.*, 2017). CLPS has been studied in several contexts for their advantages for nutrient cycling (Russelle *et al.*, 2007; Wilkins, 2008), provision of ecosystem services by enhancing agro-ecological processes (Dumont *et al.*, 2013; Moraine *et al.*, 2014a) and benefits to productivity and soil

(Bell *et al.*, 2011, Duru *et al.*, 2015, Ezeaku *et al.*, 2015).

The feed is central to livestock productivity as feed shortage is one of the major problems in most of the developing countries to augment livestock production and productivity (Samiredypalle *et al.*, 2014, IFAD 2015). The purpose of the Feed Assessment Tool (FEAST) is to offer a systematic and rapid methodology for assessing feed resources at the site level to develop a site-specific strategy for improving feed supply and utilization through technical or organizational interventions (Samiredypalle *et al.*, 2014; Shiawoya and Tsado, 2011; Wassena *et al.*, 2013; ILRI 2015; Sosina *et al.*, 2019). Hence, the study was carried out to investigate the livestock component in the crop-livestock production system in the derived savannah area of Oyo State, Nigeria.

Materials and methods

The study was the Ido area of Oyo State, Nigeria, ethnically heterogeneous with a high concentration of smallholder crop and livestock farmers. The population is 81,115 out of which 52% are males and 48% are females. The area lies within Longitudes 1°5' W and 1°39' W and Latitudes 7°9' N and 7°36' N, covering an area of 1,782.2 km². It has a bimodal rainfall pattern ranging between 1200 and 1500 mm with a major rainy season from April to August, and a minor rainy season from August to November.

FEAST tool has been developed to help to design site-specific strategies for feed supply and utilization. Parameters measured were bio-data, farmers' income group classification based on size farmland (ha), average livestock holding/household (tropical livestock unit, TLU), average dominant livestock species/household, fodder crops grown (ha), dominant fodder species planted (ha), available feed

resources and seasonality. Data collected through the individual interview was analysed as the FEAST excel template). Qualitative and quantitative data collected through questionnaires were transcribed into Microsoft Excel the FEAST Excel macro program (www.ilri.org/feast) (Duncan 2014). Data analyzed with descriptive statistics.

Results and discussion(KG) Total quantity purchased over a 12mth
Group summary

The respondents' operational scale was classified as landless, small scale, medium scale and large scale categories. The landless categories are farmers that engaged in farming activities practiced on land not owned or lease often referred to as Absentee farmers. The small scale farmers practiced agricultural activities on pieces of

land less than 5ha while the medium scale and large scale categories engaged in agricultural operations on 5-10ha and above 10 ha, respectively (as in Fig.1). There were limited landless farmers in the study area; the % of landless was 10 %. The was probably due to the large expanse of cultivated agricultural land in Ibarapa area which supported the findings of Fakoya (2007) and Sosina (2017) that reported similar result in Ibarapa area. The % of small, medium and large scale farmers in the study area were 42, 30, and 18, respectively (Fig.1). Majority of farmers in the study area were small and medium scale an indication of poverty and small holdings. This result agreed with FAO (2015); IFAD (2015), Iiyama *et al.* (2007), and Mekuria and Mekonnen (2018) that reported similar finding that majority of farmers in the sub Saharan were resource poor.

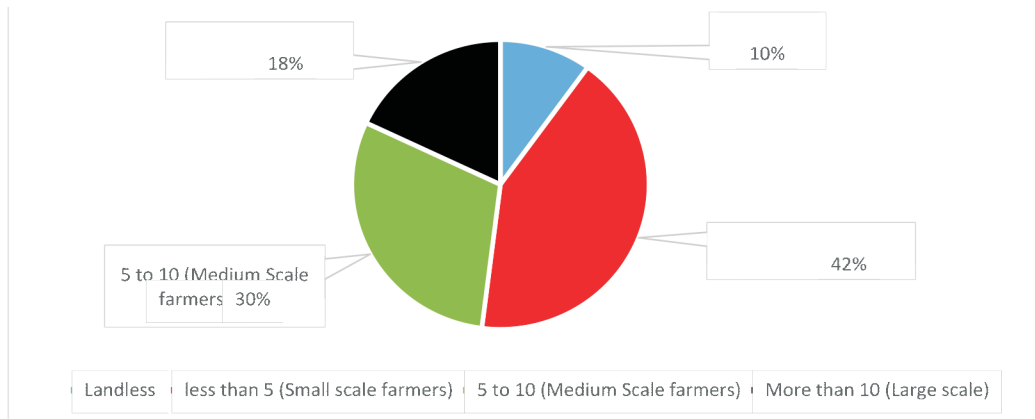


Fig.1: Group Information summary for Ido LGA

Average livestock holding/household (TLU)

The livestock reared by household in the study area were indigenous poultry, sheep, goat, local dairy calves (male and female), local dairy heifer, and local dairy (dry and lactating). The livestock species reared by crop-livestock farmers in the study area were indigenous poultry, West African

Dwarf (WAD) sheep and goat as well as indigenous dairy cattle especially the White Fulani Cattle. The average livestock holding/household (TLU) values were 0.08, 0.33, 0.37, 4.96, 5.68, 14.40, 28.80, and 67.68 poultry, sheep, goat, indigenous female dairy calves, indigenous male calves, indigenous dairy heifers, indigenous dairy lactating cows and

indigenous dry dairy cows, respectively (as in Table 1). The result agreed with Sosina (2020), Ezeaku *et al.* (2015), Moraine *et al.* (2016) and Descheemaeker *et al.* (2017) that reported similar results for small ruminants in the derived savannah area, Nigeria. The ruminant population derived adequate nutrition from the abundant feed resources and crop residues after crop harvest and processing. The synergy of crop-livestock production systems not only favour livestock production but also reduce clashes among crop and livestock

enterprises (Sosina, 2017; Duru *et al.*, 2015). Dairy cattle were predominant in the area because of the dairy or milk business in the area because of commercial milk collection center in Ibadan/Ibarapa area of Oyo State. The area is also endowed with abundant feed resources and fair share of water resources necessary for viable commercial dairy production. The result agreed with Sosina (2017) and Amole and Ayantunde (2016) that reported similar conditions for cattle production in Ibadan and Niger Republic, respectively.

Table 1: Average livestock holding/household (TLU)

Livestock species	Average livestock holding/Household (TLU)
Local Dairy cows - non lactating (dry)	67.68
Local Dairy cows – lactating	28.80
Local Dairy heifers (>6mths old - < 1st calving)	14.40
Local Dairy calves (<6mths old) – male	5.68
Local Dairy calves (<6mths old) – female	4.96
Goats	0.37
Sheep	0.33
Poultry - village conditions	0.08
Grand Total	122.32

The average livestock species holdings/household (TLU)

The species of livestock predominant in the study area are WAD sheep and goat, indigenous poultry and dairy cattle. The average livestock species holding/household values of 121.53, 10.50, 5.00, and 15.20 for indigenous dairy cattle, WAD goat, WAD sheep and indigenous poultry, respectively (as in Table 2). The result was an indication of high intensity of crop-livestock production systems in Ido area. There is high population of Fulani pastoralist farmers in the area with massive cattle population. Although the Fulani pastoralist had the fair population of settlers popularly called the sedentary type. These sedentary farmers were Fulani extractions that had settled in the area for quite some time. Some of the settled Fulani farmers do have clear accent of the indigenous language (Yoruba). The other extractions

are the nomads that are trans-human in nature that migrate from place to place in looking good quality and quantity of pastures for their cattle herds. There are very many households involved in cattle production especially among the Fulani settlers in the study area. The result agreed with the submission of Malede and Takele (2014), ATA, FMANR (2013), Sosina (2017) that gave similar findings on the dominance of Fulani farmers in ruminant production. There are abundant feed resources that are relatively available in Ido LGA which favoured ruminant production. However, Soussana and Lemaire (2014) show that in Latin America (Brazil), spatial crop-livestock integration among farms provides the opportunity for sustainable soil management through well-balanced crop-animal systems and the greatest profitability and stability of economic results for each farm.

Table 2: Average livestock species holdings/household (TLU)

Livestock Species	Average livestock species holding/household (TLU)
Local Dairy Cattle	121.53
Goats	10.50
Sheep	5.00
Poultry - village conditions	15.20

Average livestock holdings/household - dominant species (TLU)

The livestock species dominant in the study area were indigenous poultry, WAD goat, WAD sheep and indigenous dairy cattle (as

in Fig. 2). The average livestock holding/household (TLU) values were 125.25, 12.25, 7.31 and 18.67 for indigenous dairy cattle, WAD goat, WAD sheep and indigenous poultry, respectively.

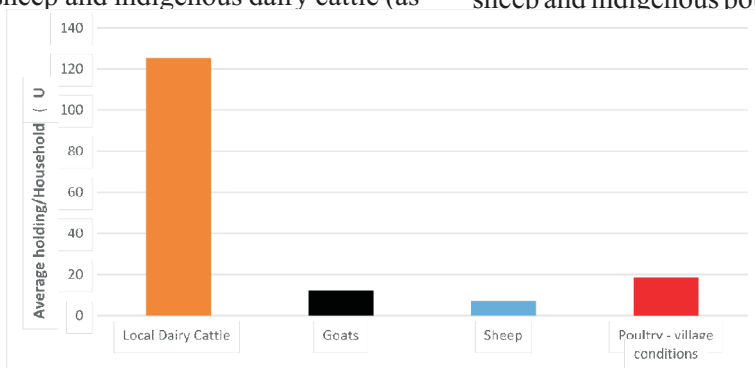


Fig.2: Average livestock holdings/household - dominant species (TLU)

The high population of Fulani farmers who are predominantly cattle farmers, in very many locations within the study area probably responsible for the dominance of indigenous dairy or cattle production. The result agreed with the submissions of Sosina (2017); Babayemi *et al.* (2014); Sosina *et al.* (2019) that reported similar findings among farmers in Ibadan/Ibarapa area and derived savannah ecological areas. The livestock production enterprise dominance in the study area is in contrast to Amujuyegbe (2012), Ayeni *et al.* (2012) and Sosina (2017) that reported the dominance of crop farmers in the rainforest ecological area of Nigeria.

Fodder crops grown in the study area

There is predominant livestock production in Ido area. The majority of the ruminant farmers often plant fodder for dry season feeding when good quality and quantity of green forage is limited. The fodder crops available or grown by respondents in Ido area were naturally occurring pastures, Maize, Stylo, Napier grass, Lablab and Leucaena (Table 3). The average area of land put to cultivation of these fodder were 8.80, 2.40, 0.80, 0.80, 0.40, and 0.30, respectively. The result agreed with the report of Amujuyegbe (2012), Enujeke *et al.* (2013), Ezeaku *et al.* (2015), Shiawoya and Tsado (2011), Sosina (2017) that gave similar findings in the derived savannah area.

Table 3: Fodder crops grown in the area

Fodder crops grown	Sum of Area (ha)
Naturally occurring pasture - tropical	8.80
Maize (<i>Zea mays</i>)	2.40
Stylo (<i>Stylosanthes guianensis</i>)	0.80
Napier grass (<i>Pennisetum purpureum</i>)	0.80
Lablab (<i>Lablab purpureus</i>)	0.40
Leucaena (<i>Leucaena leucocephala</i>)	0.30
Grand Total	13.50

Total quantity of feed purchased over 12 months (Kg)

Ruminant production thrived well in Ido LGA, the quantity of feed purchased over the last 12 month is quite impressive. The feed ingredients purchased include cassava fresh cassava peels, maize gluten meal, soy bean meal, wheat offal, cowpea haulms etc (as in Table 4). The total feed purchased ranged from Meat and bone meal (10Kg) to maize crop residue (1,500 Kg) among crop-livestock farmers in the study area. Among the higher feed purchased by respondent

farmers were Maize crop residue (1,500 Kg), naturally occurring pastures (1,096 Kg), cowpea residue (616.67Kg), cassava crop residue (520Kg), groundnut crop residue (360 Kg) and maize ground maize cob (300 Kg). These purchases were higher in the dry season when the available green pastures were limited. The result agreed with Dumont *et al.* (2013), Moraine *et al.* (2016) and Ezeaku *et al.* (2015) that reported on the roles of cowpea residues as essential feed resources for ruminant production in the dry season.

Table 4: Total quantity purchase over 12 month (Kg)

Feeds purchased	Total
Brewer's grain -dehydrated	83.33
Cassava (<i>Manihot esculenta</i>) - fresh peelings	200.00
Groundnut (<i>Arachis hypogaea</i>) - seed meal	100.00
Maize (<i>Zea mays</i>) - cracked grains	40.00
Maize (<i>Zea mays</i>) - gluten meal	200.00
Rice (<i>Oryza sativa</i>) - bran (with germs)	120.00
Soybean (<i>Glycine max</i>) - meal	30.00
Wheat (<i>Triticum aestivum</i>) - bran	150.00
Groundnut (<i>Arachis hypogaea</i>) - crop residue	360.00
Cowpea (<i>Vigna unguiculata</i>) - crop residue	616.67
Cassava (<i>Manihot esculenta</i>) - crop residue	520.00
Maize (<i>Zea mays</i>) - crop residue	1,500.00
Naturally occurring pasture - green fodder (tropical)	1,096.00
Maize (<i>Zea mays</i>) - cobs ground	300.00
Cassava (<i>Manihot esculenta</i>) - tubers	10.00
Groundnut (<i>Arachis hypogaea</i>) - Kernel	10.00
Meat and Bone meal	10.00
Grand Total	5,346.00

The quantity of feed purchased (Kg) were brewer's grain (83.33), cassava fresh peelings (200), Groundnut (100), Maize cracked grains (40), Maize gluten meal (120), soybean meal (30). Estimates have shown that ignoring crop residues as feed resources would result in serious feed shortages (Naazie and Smith, 1997). Fodder scarcity owing to climate change is already triggering conflict between herd's men and settled farmers in various parts of Nigeria (ATA, FMANR, 2013). Cowpea fodder as a feed supplement increases animal live weight gain during the dry

season (Ezeaku *et al.*, 2015). Cowpea residue is one of the most nutritious fodder resources for ruminant livestock (Tarawali *et al.*, 1997). Farmers in the dry savannas deliberately grow cowpea varieties and use management practices/cropping systems which favor forage production, even at the expense of grain production (Ayeni *et al.*, 2012). Singh *et al.* (2003) reported higher weight gain in rams supplemented with some variety of cowpea haulms and increased milk yield in cows supplemented with some variety of cowpea haulms. (Akinlade *et al.*, 2005). Moraine *et al.*

(2014b) and De Moraes *et al.* (2013) observed that in Brazil, spatial crop-livestock integration among farms provides the opportunity for sustainable soil management through well-balanced crop-animal systems and the greatest profitability and stability of economic results for each farm.

Contribution of livelihood activities to household income (%)

The various activities that contribute to the farmers' household income are agriculture (crop production), livestock, business, remittances, labour or services and others

(as in Fig.3). The contribution of livelihood activities to household income (%) was livestock (60), agriculture (20), business (10), remittances (5), labour (3), and others (2). The result agreed with Amole and Ayantunde (2016) and Sosina (2020) that reported similar contributions to farmers' livelihood in Niger Republic and Ibadan/Ibarapa area, Oyo state. However, the result was contrary to Sosina (2017); Ayeni *et al.* (2013); Ezeaku *et al.* (2015) that reported higher contribution of crop production activity to farmers' household income especially in the rain forest and derived savannah ecological areas.

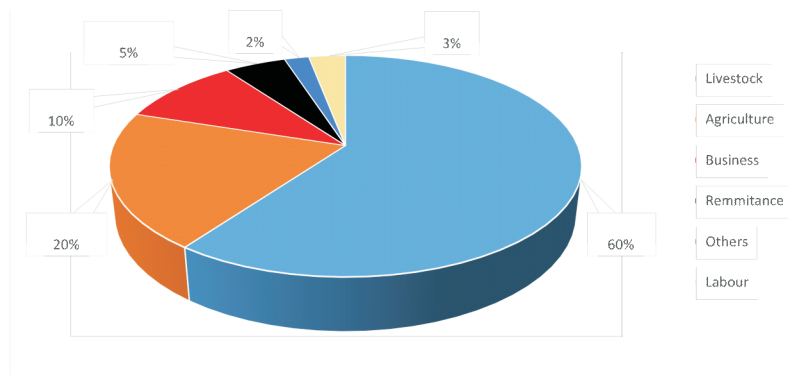


Fig. 3: Contribution of livelihood activities to household income (as a percentage)

Available feed resources

The availability of feed resources was influenced by various climatic factors especially rainfall (as in Fig.4). The feed resources identified in the study area were concentrates, green forage, green fodder, crop residues, legume residues, grazing, others and rainfall. Although rainfall

influences green forage availability but dry season favoured the availability of crop residues and processing by products in the study area. The result agreed with Fakoya (2007), Duru *et al.* (2014), and Sosina (2020) that reported similar findings on the importance of crop residues and other feed resources to livestock production in the crop-livestock production system.

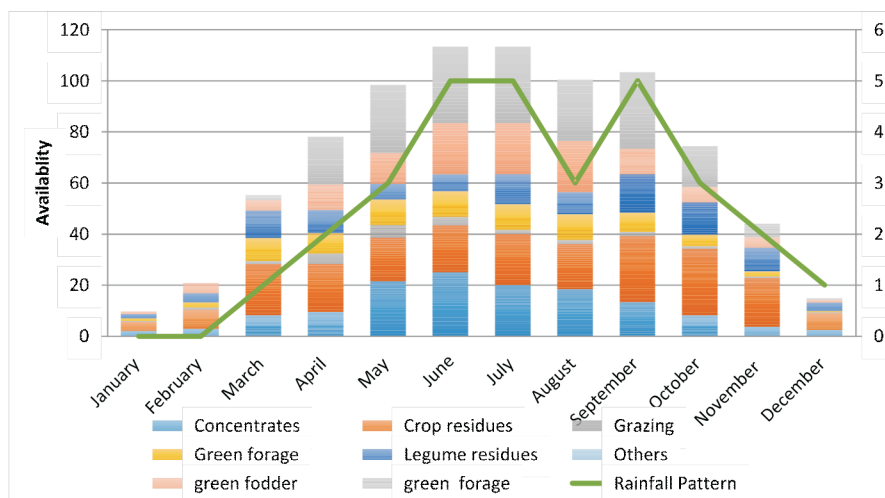


Fig.4: Available feed resources

Conclusions

The study showed that Ido LGA was oasis for crop and livestock production enterprises probably due to the availability of good quality and quantity of feed resources. The feed assessment tool (FEAST) offered a systematic and holistic approach of evaluating the available feed resources to crop and livestock production system towards achieving the necessary intervention by the donor agencies or financial institutions. The study offered leverage for decision making on commercial livestock production and its business viability.

Conflict of interest

There is no conflict of interest

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