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# CROP-LIVESTOCK PRODUCTION SYSTEMS CONTRIBUTIONS TO LIVESTOCK DIET AND FARMERS' LIVELIHOOD IN IBADAN/ IBARAPA AREA, OYO STATE, NIGERIA

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Poverty among rural farmers could be traceable to their dietary and livelihood. Little information exists on the correlation among crop-livestock production system contributions to livestock dietary and farmers' livelihood. Hence, the study tries to evaluate the crop-livestock farming contributions to livestock diet and farmers' livelihood at the system level.

A multi-stage sampling technique was used to purposively select 220 respondents involved in the crop-livestock production system, nine respondents per village, three villages per cell and three cells were randomly selected for Ibadan/Ibarapa area, Oyo state was evaluated. The livestock dietary and farmers' livelihood contributions from crop-livestock production systems were evaluated using the FEAST excel template of ILRI (2015). Data obtained from the Participatory Rural Appraisal technique were analyzed using descriptive statistics.

The average area per household (ha) for maize and cassava were 6.8 and 7.2, respectively. The average % income of livestock (62.20) to the farmers' income was higher compared with other contributors such as crop production (60.01), business (11.67), and remittance (6.12). The ME content of the total diet due to grazing was significantly highest in Ido and ranged 0.13 (Ibarapa East) to 0.4 (Ido). Crop residues, naturally occurring pasture and purchased feeds contribute a major proportion to DM intake, ME and protein of livestock diets.

Commercial and sustainable livestock production is feasible in the Ibarapa area of Oyo State, Nigeria due to the abundance of good quality and quantity of available feed resources thus improving farmers' livelihood through the crop-livestock production system.

**Keywords:** Poverty, production systems, remittance, nutrition.

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Poverty remains so deeply entrenched in the rural areas of many low-income countries that it slows economic and social progress. In sub-Saharan Africa, where the majority of men and women depend on agriculture for their livelihoods (FAO, 2011), average family farms are small and getting smaller (FAO, 2014), capital investment per farm worker has been flat or declining for three decades (FAO, 2012). Also, agricultural extension advisory and support services for production and diversification are inadequate (FAO, 2014). This provides a brief profile of rural poverty to illustrate both the importance of agriculture to the livelihood strategies of the rural poor and the inability of agricultural or other productive-sector interventions alone to reach the poorest family farms.[i]

The majority of the livestock population in Nigeria is in the hands of farmers with extensive management systems (RIM, 2010) of which management practices very sustainable to commercial ruminant production over the years. The free range system may be a healthy practice for ruminant management during the rainy seasons, at least for the abundance of forage availability, and but unhealthy during the dry seasons as livestock infringement on the neighborhood property often lead to conflicts with crop farmers. In addition to the modified semi-intensive management of the cattle by herders (Ayuk et al 2012), other pastoral management systems commonly practiced by cattle herders in the country

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include the exclusive, transhumant and agro-pastoral systems. The exclusive pastoral practice or nomadism entails sole management of the ruminants, especially cattle for the socioeconomic wellbeing of the pastoral farmers (Chah et al 2013).

The exclusive pastoralists do not grow crops but simply depend on sales of their ruminants and dairy products to meet their food needs (Fakoya, 2007). As a feeding practice, the exclusive pastoralists usually move their animals over long distances, usually through a set migration routes, (Olafadehan and Adewumi, 2011) in search of pasture for their animals or by going into an advance arrangement with crop farmers for collection of crop residue for their animals (Lawal-Adebowale, 2012). The transhumant pastoralists (Chah et al 2013), often have a permanent homestead and base at where the older members of the community remain throughout the year. The herds are however regularly moved in response to seasonal changes in the quality of grazing and the tsetse-fly challenge, or in an attempt to exploit seasonal availability of pasture (Lawal –Adebowale and Alarima, 2011).

However, feed for livestock is often cited as the main constraint to improved productivity in smallholder systems. Overcoming this constraint often seems an elusive goal and technical feed interventions tend to adopt a trial-and-error approach that often fails to adequately diagnose the nature of the feed problem and therefore the means to deal with it (ILRI, 2012). The purpose of the Feed Assessment Tool (FEAST) described here is to offer a systematic and rapid methodology for assessing feed resources at site level with a view to developing a site-specific strategy for improving feed supply and utilization through technical or organizational interventions. **FEAST** comprises two main elements, the PRA exercise which aims to provide an overview of the farming system with particular emphasis on livestock feed aspects and the simple and brief quantitative questionnaire, designed to be completed with selected farmers under the guidance of the FEAST facilitator (Duncan et al 2012). Wassena et al (2013) and Sosina (2017) evaluated the relationship that existed between the livestock nutrition and farmers' livelihood in Ibadan/Ibarapa area using FEAST in Tanzania and Nigeria respectively.

Hence, this study evaluated the contributions of crop-livestock farming to livestock diet and farmers' livelihood at the system level in the Ibadan/Ibarapa area, Oyo state, Nigeria.

## MATERIALS AND METHODS

The study took place in the selected locations of Oyo State of Nigeria an ethnically heterogeneous area with a high concentration of smallholder crop and livestock farmers, considered as the occupational group with a high incidence of poverty. 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 $km^2$. A multi-stage sampling technique was used to purposively select 220 respondents involved in the crop-livestock production system, nine respondents per village, three villages per cell and three cells were randomly selected for Ibadan/Ibarapa area of Oyo state, were evaluated. The livestock dietary and farmers' livelihood contributions from crop-livestock production systems were evaluated using the FEAST excel template of ILRI (2015). Data obtained from the Participatory Rural Appraisal technique were analyzed using descriptive statistics.

## RESULTS

**Crop grew**: Table 1 showed the average area per household (ha) of crops grown in the study area. The major crops grown include maize, cassava, cocoa, cassava; yam, maize, banana, etc, while maize and cassava production was significantly higher in Ido. The average area per household (ha) in Ibadan/Ibarapa area for both maize and cassava was 6.8. This could be due to the derived savannah ecological zone favored large scale maize and cassava production.The derived savannah had its fair share of rainfall with a bimodal rainfall pattern, which is favorable to major food and cash crops. Hence, the average area per household (ha) for cocoa, banana, sweet

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orange, green pepper, and local yam were 6.0, 2.6, 2.5, 1.2 and 1.1, respectively.

Table 1: Average hectarage of crops grown

| **Average Area in Hectare** | |
|---|---|
| **Crop Name** | **Total** |
| Cassava (*Manihot esculenta*) | 6.80 |
| Maize (*Zea mays*) | 6.80 |
| Cocoa (*Theobroma cacao*) | 6.00 |
| Banana (*Musa acuminata*) | 2.40 |
| sweet orange (*Citrus sinensis*) | 2.40 |
| Green Peppers (*Capsicum annuum*) | 1.20 |
| Yam white (*Dioscorea alata*) | 1.20 |
| Yam yellow (Dioscorea cayenesis) | 0.80 |
| **Grand Total** | **27.60** |

**Fodder grew**: The fodder crops grown in the study area were as shown in Fig.2 are Napier grass, *Leucaena*, naturally occurring pastures, *Stylosanthes* and *Lablab*. The average area of fodder crops grown per household (ha) was generally, 0.35 for Napier grass, *Leucaena*, *Stylosanthes* and Lablab. There are no significant differences in the average area of fodder crops grown per household (ha) in the study area, except for naturally occurring pastures.

Fig.1 revealed that maize was the most dominant crop grown in the study area with an average area per household (ha) of maize is significantly highest with 6.8.

**The dominant fodder crop is grown:** The dominant fodder crops grown in the study area as shown in .2 were maize, Napier grass, *Leucaena*, naturally occurring pasture, *Lablab* and *Stylosanthes*. The average area of fodder crop grown (ha) was significantly higher with naturally occurring pastures and maize 9 and 2.3, respectively (ILRI, 2012). The growing of Napier grass, *Leucaena*, *Lablab* and *Sylosanthes* as fodder in the study area was low; ranged 0.1 to 0.6 ha.

**The contribution of livelihood activities to household income (as a percentage):** The FEAST also provided the opportunity to evaluate the contribution of livelihood activities to household income as in Fig 3. FEAST evaluated four major contributors to

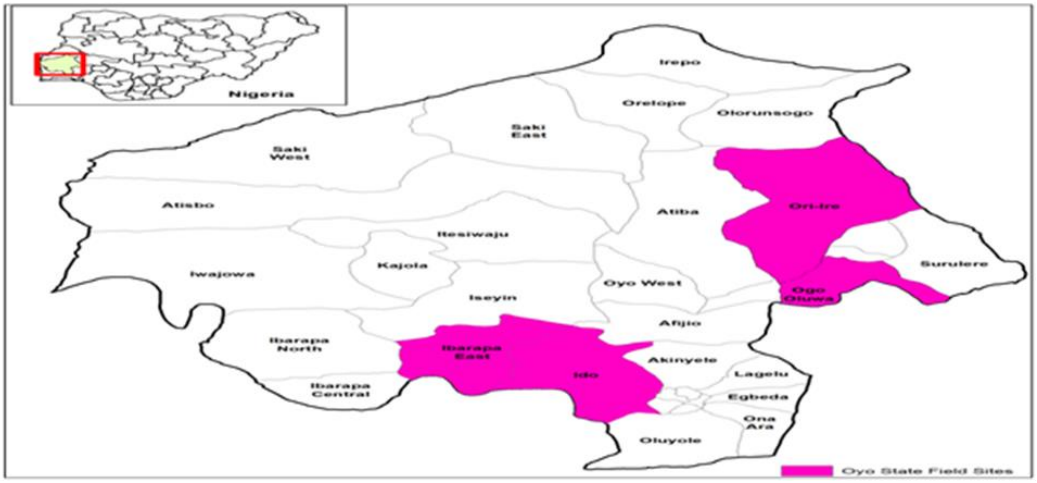


Fig 1: Nigeria map showing the location of Oyo state and the selected local government area

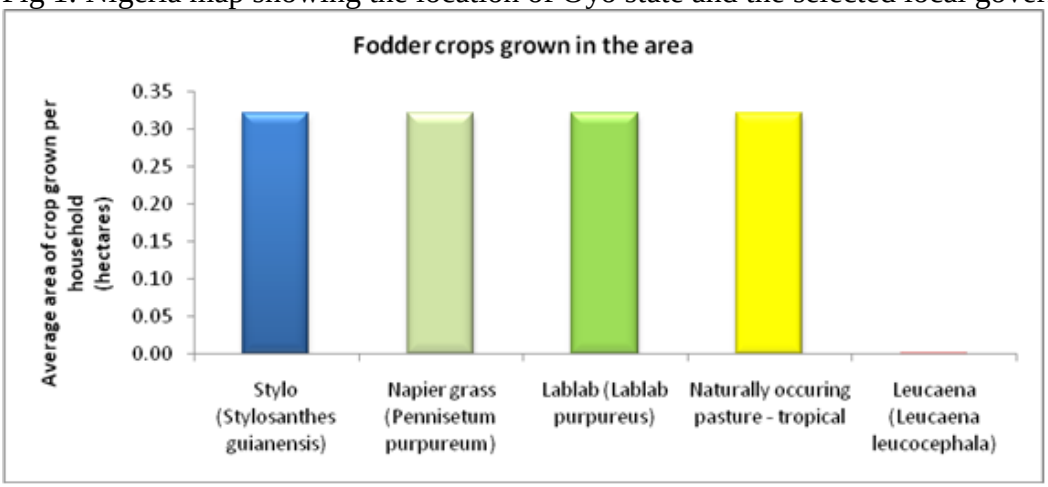


Figure 2: Dominant fodder crops are grown in the area

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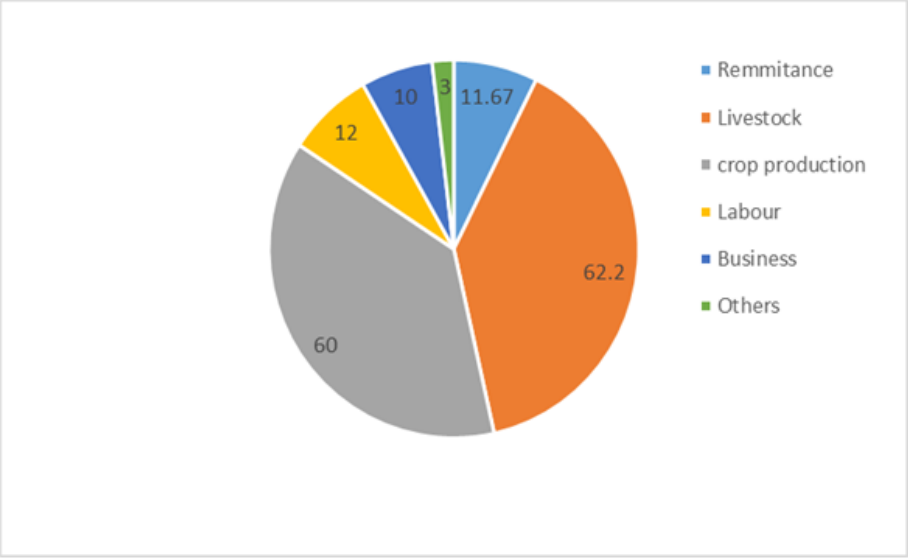


FIG. 3: Contribution of livelihood activities to Household Income (%)

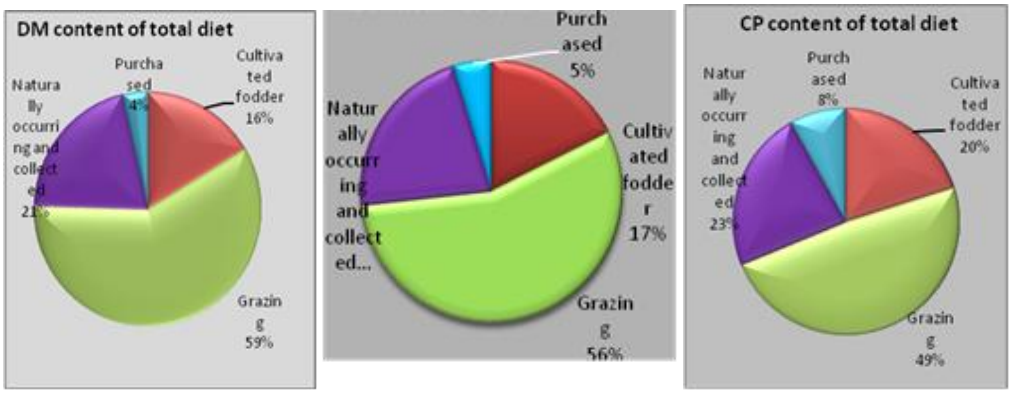


Fig 4. The contribution of feed resources to dry matter, metabolizable energy and crude protein content of the total diet in Ido LGA

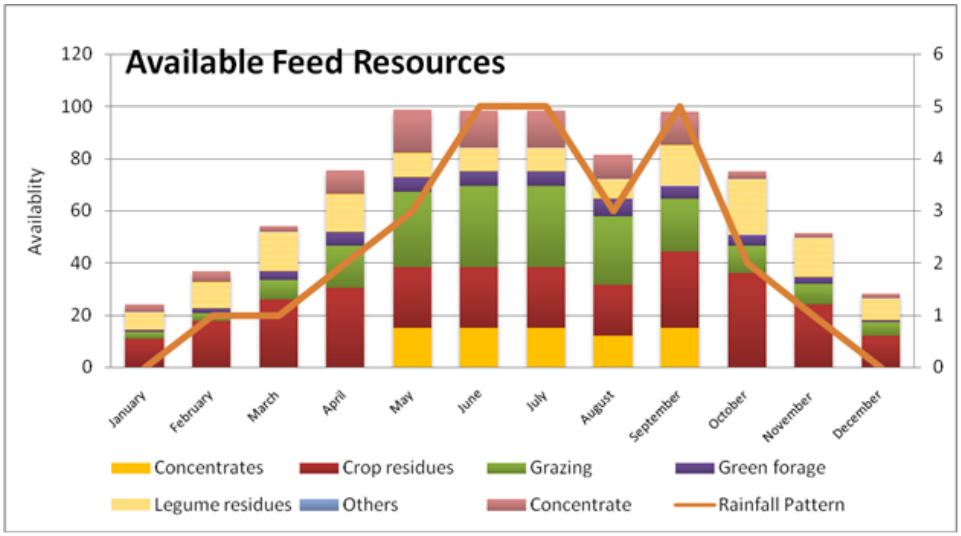


Fig 5. Seasonal variation in the contribution of different feed resources in Ido LGA

the farmer average % of income as crop production, livestock, business, and remittance.

**Crops**: The contribution of crop production to the average % income of respondent farmers in the study area was 60. Crop production ranks next to Livestock, but higher than other livelihood activities i.e business and remittance, an indication that

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crop production forms the mainstay of respondents' income.

**Livestock**: Livestock contribute to the average % income of respondents in the study area was 62.2. The average % income of livestock to the farmers' income was higher compared with other contributors such as crop production, business, and remittance. This suggested that livestock was ranked next to crop production among the respondent farmers in the study area.

**Business**: Business was 11.67%, was ranked next to livestock and crop production in the contribution of business to the average % income of respondent farmers in the study area. This result showed that only a few of the respondents were individuals in business i.e petty trading to complement their main source of income.

**Remittance**: There was no significant contribution of remittance to the average % income of respondent farmers in the study area. The remittance 6.12 % was the least kind of income that comes from wards, spouses outside the village or systems level from cities or abroad which are very consistent, mostly received every month.

**Dietary composition of feed resources:**

The dietary composition of feed resources (comprising of crop residue, cultivated fodder, zero-grazing, naturally occurring pastures and purchased feed) for the study area was as shown in Fig.4. The crop residue was a class of FR obtained after crop harvest where the fruits were harvested while the leftover was made available to the livestock. The cultivated fodder (grass and legumes) was deliberated planted for the ruminants. Zero grazing is a ruminant feed fed by cut and graze model. Naturally occurring pastures are FR that was made available to the grazing animal when involved in the extensive management system. From the feed resources available to the livestock, the major dietary composition of the feed resources considered were DM content, ME content and CP content of the total diet as in Fig 4.

**DM content of total diet:** The (%) DM content of crop residue was significantly highest for naturally occurring pastures compared with other FR in the study area. The DM (%) content of the total diet due to grazing was significantly high (0.6) in Ibadan/Ibarapa area. This result suggested that a substantial amount of DM content in livestock can be due to grazing. The high % DM content of the total diet can be traceable to naturally occurring pastures. Feeding with naturally occurring pastures was cheaper compared with other feed resources for commercial ruminant production in the study area.

**ME content of total diet:** The ME content of the total diet for crop-residues was (expressed as % as against the Kcal/Kg) significantly highest for crop residue which ranged from 0.05 to 0.85. There were no significant differences in the ME content of cultivated fodder across the locations considered in the study area as in Fig 34. The ME content of the total diet due to grazing was significantly highest in Ido and ranged 0.13 to 0.4. For naturally occurring pastures, there are significant differences in the ME content of the total diet which ranged 0.02 to 0.71.

**CP content of the total diet**: The result obtained on CP content (%) of the total diet as in Fig 3 also follows the same pattern as reported for ME content of the total diet from the available feed resources in the study area. Interestingly, these results point to the fact that the cost of ruminant production from available local feed resources favorable in the study area.

**Available Feed Resources:** The number of available feed resources evaluated along with the rainfall pattern in the study location using the FEAST as in Fig. 5. The available feed resources estimated in this study were concentrates, green forages, green fodder, crop residue, legume residues, grazing, and others.

The availability of some of these feed resources was influenced by the rainfall pattern like the number of times there was rainfall in a particular month. Heavy or adequate rainfall favored the availability of abundant feed residues like green forage, green fodder, and grazing, the whole dry season favored or associate with concentration crop residue, legume residue, especially at a particular period.

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## DISCUSSIONS

The average area per household (ha) in Ibadan/Ibarapa area for both maize and cassava were higher for maize and cassava in Ido, which supported Amujuyegbe (2012) and Samiredypalle et al (2014) that reported optimum productivity of maize and cassava can best be achieved in the derived savannah ecological area.

There was an abundance of maize fodder for livestock or ruminant production in the study area, supported by Olafadehan and Adewumi (2011) and Samiredypale et al (2014) that reported similar result for derived savannah ruminant production. The average area of fodder crop grown per household (ha) for naturally occurring pastures in the study area was 8.2 in Ido with naturally occurring pastures had a significantly higher average area of fodder crops grown per household (ha). This finding agreed with the report of Lawal-Adebowale (2012) that reported the abundance of fodder for large scale ruminant production in the derived savannah area. Onwuka et al (1997) also reported the abundance of fodder and crop residues as potential ruminant feed.

Ruminant farmers with the knowledge of crop-livestock integration will deliberately plant hectares of fodder crop especially maize with the sole aim of feeding them to ruminants especially during the dry season. Farmers often practice this integration when the feed for ruminants becomes limiting or can even offer monetary value of such fodder crops to farmers who had experienced crop failure due to adverse climatic change. This result was also supported by Babayemi et al (2014) that reported similar charges by crop farmers on their fodder after maize harvest for pastoralist especially in the dry season in Osun state, Nigeria. The change in climate often leads to the immaturity of the maize plantation, abrupt stoppage of rainfall prior to fruiting, rather than becoming a total loss to the farmer especially during late season maize cropping, they become fodder for ruminant feeding. This integration often enhances social interactions among the various farming communities and incessant conflict between agro-pastoralists and crop farmers is thus ameliorated. Knowledge on the planting of fodder crops for ruminant production should be encouraged and intensified by the extension officers at the system level rather pastoralism especially during the dry season when available forage quality and quantity becomes limiting.

Crop production contribution to farmers' income agreed with the findings of FAO (2015) that agriculture remains the highest contributor to the populace income, especially in the sub-Saharan. However, contrary to the ATA (2013) that reported higher national income accruing from oil than agriculture.

Livestock production contribution to farmers' income supported the report of Okumadewa (1999) and Amujuyegbe (2012) that livestock in the major contributor to farmers' income. Babayemi *et al*., (2014) reported the significance of livestock to the farming household income and livelihood in Osun state but in contrast to the report of Amole and Ayantunde (2016) that reported that livestock was ranked ahead of crop agriculture in the contribution of livelihood activities to household income.

The contribution of business to farmers' income supported the finding of ATA (2013) agriculture and agricultural enterprises should be a business not just a way of life. This result is in contrast to the finding of Eniekeje et al (2013) that business hinders the involvement of youth in livestock and agricultural production especially in the southeast of Nigeria. A major business engaged by respondent farmers in the study area petty trading, blacksmith, carpentry and other artisans. Remittance from this finding is no doubt, not the mainstay of the respondent income in the study area.

The nutritional contribution (CP and DM content of total diet) of the available feed resources findings agreed with Olafadehan and Adewumi (2011) that reported low cost of production in the savannah ecological zone but contrary to Lawal-Adebowale (2012) that reported higher incidences of crop farmer – pastoralist crises in Savannah area due to the high dependence of ruminant on naturally occurring pastures. Summarily, the highest DM content of the total diet from available feed resources to livestock in the

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study area favored the use of naturally occurring pastures.

The ME content of the total diet suggested that higher % of ME content of the total diet required for various physiological activities can be traceable to the naturally occurring pastures in the diet. Consequently, commercial ruminant production and reduced cost of production is favorable in most locations in the study area.

Moreover, feeding with naturally occurring pastures will be more nutritious in terms of higher and efficient provision of ME and CP content of the total diet compared with other feed resources for ruminant production. The result probably accounted for the high pressure of Fulani farmers and numerous herds of cattle, sheep, and goats in the study. They often migrate down (to other locations) during the dry season looking for available pastures and water which are highly endowed with appreciable water bodies for commercial ruminant production.

The major feed source available throughout the year was Maize Residues (MR), MR (eeri) was the main component in the diet of small ruminant diet in the study area. Farmers fatten animals using cassava peels (wet and dry), usually obtained as by-products from local cassava processors. They mixed chopped maize stover and other crop residues especially during harvest for the small ruminant. Poultry relies on cereals such as maize grain, sorghum, millet, etc. The mixtures stirred by hand until it became wet and soft enough for animal consumption. Crop residues, naturally occurring pasture and purchased feeds contributed major proportion to DM intake, ME and protein of livestock diets. Feeds such as wheat bran, Groundnut cake, Palm Kernel cake and commercially formulated mixed rations were the main concentrate feeds that were purchased. Fig. 3 showed the contribution of various feeds to the DM, ME and CP content of total diets of animals. The purchased feed was the predominant source of feed in all the way, possibly because they have improved cattle. They also do not graze their animals even during the rainy season (Samiredypalle *et al.*, 2014 and Babayemi *et al.*, 2014).

The available feed resources in the study area result were supported by Amole and Ayantunde (2016) that reported the availability of crop residue immediately after crop harvest beneficial to the livestock. The feed resources available for livestock are green forage, green fodder, crop residues and legumes residues green forage, natural pasture (grazing), concentrates and others. The availability and abundance of these feed resources were rainfall dependent while some feed resources were available only during the rainy season, thus the quality and quantity of the feed resources were affected. In the early dry season of January and March, the availability of the crop residues was very high which coincide with the period of harvest especially the cereals. There were abundant fodder and forage found during this period though, from the results, crop residues remain the main feed resources at the end of the wet season, which also coincided with the harvest period (Amole and Ayantunde, 2016). A similar result by Fernandez-Rivera *et al.*, (2005) in Southwest Niger showed that the end of the growing season for herbage also coincides with the peak of the availability of millet stover. Grazing of natural pasture constitutes the main source of animal feed throughout the year with maximum availability during crop growing season (June to December) in all the three villages. Although there is plenty of natural pasture during the wet season, farmers in the study area do not have a tradition of conserving and keeping the excess forage for the dry season, when there is a relative shortage of feed (Duressa *et al*, 2014). The result from the study is in contrast to findings of Amole and Ayantunde (2016) and Herrero *et al.*, (2010) that limited cropping season to only once in a year from June- October when a moderately high amount of millet stover was available in the villages from harvest time to February.

It was observed that maize stover represented the largest purchased resource followed by the grass from the natural pastures, cassava crop residue, cowpea and groundnut haulms. The roughages accounted for almost 70% of the total feeds purchased indicating the large and small ruminant

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livestock population. This result agreed with the report of Samireddypalle et al (2014) that reported similar result with Oyo state survey and Sosina (2017) for Ibadan/Ibarapa area of Oyo state.

## CONCLUSION

Ruminant farmers with the knowledge of crop-livestock integration will deliberately plant hectares of fodder crop especially maize with the sole aim of feeding them to ruminants especially during the dry season. Farmers often practice this integration when the feed for ruminants becomes limiting or can even offer monetary value of such fodder crops to farmers who had experienced crop failure due to adverse climatic change. All the surveyed revealed that farmers were cultivating multiple crops and livestock was an integral and part of the agriculture contributing substantially to the income. Small ruminants and rural poultry were the predominant animals and were mostly reared under extensive to semi-extensive systems with less reliance on quality feeds

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