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# GENDER INEQUALITY IN LIVESTOCK ASSET OWNERSHIP: IMPLICATION FOR FOOD SECURITY IN THE WA WEST DISTRICT, GHANA

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**Abstract.** Food security is a complex phenomenon involving socio-cultural and economic factors. This study examines the impact of gender inequality in livestock asset ownership on household food security in the Wa West District of Ghana. Data were collected from 400 households based on a cross-sectional survey and a multistage sampling of the respondents. Gender disparity in livestock asset distribution among men and women within the household was ascertained using the Gini index. In contrast, the household food consumption score technique was employed to determine the household food security status. A binary logit regression model was used to assess the effect of gender inequality in livestock assets on household food security. The results indicated that men owned 1.72 TLU compared to an average of 0.22 TLU owned by women. Livestock's contribution to household food security was estimated at 16% of annual household food expenditure, with a composition of 0.90% for jointly owned, 6.04% for women-owned and 9.14% for men-owned livestock. Also, 33% of households were food insecure and 67% of them were food-secure at the time of the survey. The empirical results showed that a unit increase in the Gini index of livestock asset distribution in favour of men harms household food security. The results further showed that household ownership of livestock, as well as farm size and education, negatively influence household food insecurity. In contrast, household size, female-headed households and dependency ratio positively affect household food insecurity in the study area. Based on the study, it is recommended that development programmes target women's economic empowerment and education to bridge the livestock assets gender gap and improve food security.

**Keywords:** food security, food insecurity, asset, gender inequality, livestock ownership, Gini index

## INTRODUCTION

Food insecurity continues to limit the development of African countries because it leads to deteriorated physical and mental health and civil unrest, which are major challenges to human development and economic growth (Carter et al., 2010). Even though some progress in terms of food security and hunger reduction is being made, food insecurity remains a global issue (FAO, 2015). An estimated 795 million people globally do not have enough food due to poverty (FAO, 2015). Ninety-eight per cent of these food-insecure persons reside in developing countries, with Sub-Saharan Africa presenting the highest incidence of food insecurity and poverty globally (Ali and Khan, 2013). Though Ghana achieved the Millennium Development Goal One (MDG1) target of halving extreme poverty by 2015, it struggles to feed its populace, especially in the three northern regions (Biederlack and Rivers, 2009). Food insecurity prevalence ranges from twenty to thirty-seven per cent in these regions, much higher than the national undernourishment prevalence of five per cent (Biederlack and Rivers, 2009). Food insecurity has reached extreme levels in some parts of northern Ghana, with over 680,000

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people either suffering either severe or moderate food insecurity (Hjelm and Dasori, 2012). A household is food-secure once it has access to adequate food to enable all its members to lead a healthy life (adequate in terms of quality, quantity, safety and cultural acceptability) and is free from undue risk of losing such access (Von Braun, 1993).

It is often rightly argued that poverty is both the result and cause of food insecurity. Asset deprivation as a broader form of poverty is, therefore, a major factor of food insecurity. Discrimination against women in jobs, asset ownership and other economic opportunities is the foundation of the bias against female-headed families (Sen, 1997a). Gender and intra-family inequalities in asset ownership and income distribution are the most obvious illustration of the anti-female cultural biases, resulting in undue risk in terms of food access. The greater the gender inequality in the distribution of assets, the more difficult it is for the poor to reduce malnutrition and hunger (Biederlack and Rivers, 2009). Improving household food access thus necessitates socially balanced solutions that contest the gendered dimensions of biased power relations and asset ownership within households. The equal ownership and control of resources by both men and women within the household is important for improving household livelihood strategies and achieving food security (Doss et al., 2014). Therefore, the socio-cultural complex that influences gender asset ownership is crucial for household food security. For instance, cultural norms and legislation on asset ownership have long discriminated against women, including female children (Deere and Doss, 2006). Based on Sen's (1997b) food entitlement view, food security depends on the society's entitlement system (Srinivasan, 1983).

According to Sen (1997b), entitlement refers to a set of alternative commodity bundles that a person commands in society, encompassing all the rights and opportunities they possess. This entitlement boundary is based on asset ownership. Gender inequality in asset ownership results from the interconnected social and economic processes that discriminate against women and ultimately undermine household food productivity and food security (Assan, 2014). This inequality denies women their full capabilities, which is connected with low food entitlement for women and the household at large (Sen, 2000). Therefore, the achievement of household food security largely depends on addressing the socio-cultural factors that result in inequalities and prevent impoverished women and households from having access to food. In practice, achieving food security requires transformations in the socio-economic and cultural sectors in such a way as to meet food and nutritional requirements. From the perspective of gender inequality and rights, addressing people's access to food necessitates the use of socially balanced solutions that contest the gendered dimensions of biased power relations and asset ownership within households.

It is natural to assume that increased food production and economic growth would improve household food security and nutritional status through increased income and food accessibility. However, the extensive focus on food production and economic growth at the expense of socio-cultural considerations had not guaranteed food access for all households (Bruinsma, 2003). Furthermore, although numerous studies have illustrated the effects of gender inequality on food security, there is a dearth of empirical research evidence pertaining to the impact of gender asset ownership inequalities on food security (Doss et al., 2011). Moreover, food insecurity concerning gender inequality in livestock asset ownership has not been empirically examined in the study area – the Wa West District of Ghana.

## MATERIALS AND METHODS

This study employed a cross-sectional survey with a concurrent mixed-method design where the quantitative and qualitative phases are roughly simultaneous with no data dependency (Onwuegbuzie and Collins, 2007). A multistage random sampling to select study communities and a combination of purposive and random sampling techniques to select respondents were used. Semi-structured questionnaires and focus group discussions were employed to gather sex-disaggregated data on livestock asset ownership within the households studied. The tropical livestock unit (TLU) was used to convert the different livestock assets for comparison. TLU is a standard convergence unit for livestock assets across various species and is defined as livestock's weight-based species exchange ratio (FAO, 2002). The conversion of livestock into TLU using species-equivalent TLU ratios did not account for livestock breed, rearing and feed system variations and is endorsed only for general analysis purposes (Njuki et al., 2013). The Sub-Saharan Africa TLU conversion factors used in this study are summarised in Table 1.

**Table 1.** Sub-Saharan Africa tropical livestock unit conversion factors

| Livestock species | TLU Equivalent |
|---|---|
| Cattle and horse | 0.5 |
| Pig | 0.3 |
| Sheep and Goat | 0.1 |
| Duck and Turkey | 0.03 |
| Chicken | 0.01 |

Source: FAO, 2002.

The formula for calculating the TLU for a given species is as follows:

$$\text{TLU} = \text{Species stock} \times \text{species TLU equivalent} \quad (1)$$

Hence, total livestock holdings in TLU for the various species were determined as:

$$\text{Total livestock holdings} = \sum_{i=1}^{n} \text{TLU}_i \quad (2)$$

where: $TLU_i = TLU$ for $i^{th}$ species and $n$ = number of species type owned.

Total male- and female-owned household livestock assets in TLU were determined, and the inequality in livestock asset stock was calculated using the Gini index. The Gini index is traditionally used to determine income distribution inequality but can be applied in welfare analysis such as education, consumption, health, and assets inequalities (WFP, 2008). In principle, when there is perfect income or assets distribution in a population, the Lorenz curve becomes equal to the line of perfect equality and the Gini index is 0. On the other hand, when income or assets distribution is completely unequal, the Gini index is 1. The Gini index thus has a lower limit of 0 and an upper limit of 1. Using assets instead of income to measure inequality is deemed to be more theoretically appropriate and empirically reliable (McKenzie, 2005). However, the Gini index is not decomposable – the Gini index of a population is not equal to the sum of the Gini indexes of its subgroups (Yitzhaki and Schechtman, 2013). Figure 1 below represents the Lorenz curve and the perfect equality line.

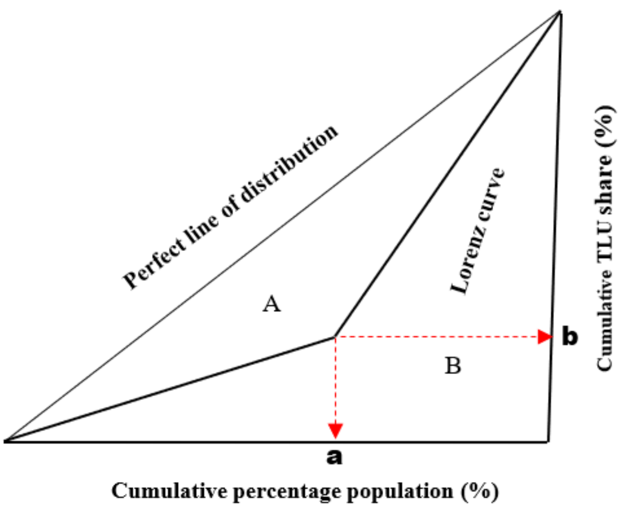


**Fig. 1.** Lorenz curve and Gini index
Source: Yitzhaki and Schechtman, 2013.

Mathematically, based on figure 1 above, the Gini index is calculated as follows:

$$\text{Gini} = \frac{A}{A+B} = |a - b| \quad (3)$$

where: $A$ – represents the area between the Lorenz curve and the line of perfect equality, and B – represents the area below the Lorenz curve. Theoretically, since the total area under the equidistributional line is half $\left(\frac{1}{2}\right)$ of the area of a rectangle, it implies that:

$$\text{Gini} = 1 - 2B \quad (4)$$

The household food consumption score (HFCS) indicator was used to determine the household's food security status in this study. HFCS is one of the best food security indicators because it captures people's dietary diversity and nutrient adequacies (Bilinsky and Swindale, 2007). In addition, HFCS has been used to successfully distinguish food-secure households from food-insecure ones across diverse socio-cultural contexts (Coates et al., 2007).

## Food consumption score (FCS)

A questionnaire was used to gather data on the household's consumption frequencies of eight different food groups over the previous seven-day period. The FCS was then determined by multiplying the consumption frequency by the respective standardised food group nutritional weight (Table 2) and the composite score calculated by summing the results.

**Table 2.** Food groups used to construct FCS

| Food Group | Weight |
|---|---|
| Cereals, roots, tubers and plantain | 2 |
| Meat and fish | 4 |
| Milk | 4 |
| Oil and fats | 0.5 |
| Fruits | 1 |
| Vegetables | 1 |
| Pulse | 3 |
| Sugar | 0.5 |

Source: WFP, 2008.

Households were then classified as "poor consumption" if the composite FCS was less than 21, "borderline consumption" if the FCS was between 21 and 35, or "acceptable consumption" if the FCS was greater than 35, by applying World Food Programme (WFP) recommended cut-off consumption scores (WFP, 2008).

## Binary logit regression model

The binary logit regression model was used to determine the effect of gender inequality in livestock assets on household food security. The logit model is a multivariate method used to investigate the relationship between a dichotomous dependent variable and more independent variables (Poveda et al., 2005). A dichotomous dependent variable takes only two values (1 and 0). This assumes that the dependent variable ($Y$) is binary (0 and 1), and the independent variables ($X_1$, $X_2$, $X_3$…) could be continuous, discrete or be a combination. The logit regression model is expressed as follows (Greene, 2008):

$$Y_i(0,1) = X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + + X_7 + X_8 + X_9 + X_{10} + \dots \quad (5)$$

Assuming that household food security is a function of $X_1$…, the initial model is as follows:

$$= \beta_0 + \beta_1 X_1 \quad (6)$$

$$= \beta_0 + \beta_1 X_1 + \beta_k X_{ik} \quad (7)$$

$$\text{Logit}\prod_i = \log\left(\frac{\prod_i}{1-\prod_i}\right) = \beta_0 + \beta_1 X_1 \quad (8)$$

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \dots + \varepsilon_i \quad (9)$$

where: $Y$ – dependent variable, $X$ – independent variables, ε – error term.

The logit regression model assumes that the outcome variable $Y$ is dichotomous (yes = 1 or no = 0). The proportion of cases for which $Y = 1$ is defined as $p = P$ ($Y = 1$). Then, the proportion of cases for which $Y = 0$ is $1 - p = P$ ($Y = 0$). Estimation of p can be done by the sample proportion of cases for which $Y = 1$. But an assumption exists as a set of predictor variables, $X_1 \dots X_{10}$, related to $Y$ can provide further information to aid in the prediction of $Y$.

$$\text{Logi}\,P_i = \ln\left(\frac{P_i}{1-P_i}\right) = \alpha_0 + \beta_1 X_1 \dots + \varepsilon \quad (10)$$

Where $\ln\left(\frac{P_i}{1-P_i}\right)$ = log for the choices (Yes or No), $P_i$ = yes, $1-P_i$ = no, β = coefficient $X$ = covariates and ε = error term.

Therefore, the logit model is specified empirically as indicated in (11) as follows:

$$\text{Logit}\left(\frac{P_i}{1-P_i}\right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + + \dots \varepsilon_i \quad (11)$$

Variables in the regression model are presented in Table 3.

**Table 3.** Co-variables included in the binary regression model

| Variables | Type | Description | Expected sign |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| Gini | Continuous | Livestock assets inequality index | + |
| HHsex | Dummy | 0 equal male and 1, if female | + |
| Age | Continuous | Age in years | – |
| Educ. | Continuous | Number of years spent in school | – |
| HseSize | Continuous | Number of household members. | + |
| Farmsize | Continuous | Size of cropped land in hectares (ha) | – |

**Table 3 – cont.**

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| SoNwk | Dummy | 0 equal membership of an association, 1 otherwise | – |
| NfInc. | Continuous | Income from non-farm activities in (GH₵) | – |
| Dep. | Continuous | Number of household dependents | + |
| HH TLU | Continuous | Household livestock in tropical units | – |

Source: own elaboration.

## RESULTS AND DISCUSSION

The study results presented in Table 4 indicate that livestock asset portfolios of men and women included cattle, sheep, goats, pigs, ducks and poultry. While the different types of livestock species are kept by both men and women, there exist great disparities in animal species stock among the two sexes. The results show that for every 0.04 TLU of cattle owned by women, men-owned 1.98 TLU. In other words, for every 1 head of cattle owned by a woman, men owned 49. This result implies that men own higher numbers of livestock than women. Also, for every 7.7 TLU of poultry owned by women, men held 8.66 TLU, implying that for every 10 poultry birds owned by women, men owned 13. The results indicate similar stock trends for goats, sheep, pigs, and ducks. Thus, the results show large disparities in stock levels across all animal species for men and women except for duck which was the least stocked livestock among men and women. This could explain why no significant difference existed between stocks of men and women.

In general, the results indicate that men typically owned 1.712 TLU compared to an average of 0.221 TLU owned by women. This means that for every 1 TLU owned by women, men owned 7.75 TLU. Doss et al., 2014; Meinzen-Dick et al., 2011 reported similar findings. An in-depth inquiry into why there exists a major gap between men and women in animal stock levels revealed that this livestock gender gap was influenced by cultural and socioeconomic factors. For instance,

**Table 4.** Livestock holdings in TLU by sex

| Livestock | Men | | Women | | T-test statistics | |
|---|---|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. | Mean | Sig (2 tailed) |
| Cattle | 0.99 (1.98) | 1.802 | 0.02 (0.04) | 0.147 | 0.97 (1.93) | 0.000*** |
| Sheep | 0.19 (1.89) | 0.329 | 0.02 (0.23) | 0.084 | 0.17 (1.67) | 0.000*** |
| Goat | 0.37 (3.69) | 0.322 | 0.09 (0.90) | 0.144 | 0.28 (2.79) | 0.000*** |
| Pig | 0.07 (0.36) | 0.374 | 0.002 (0.04) | 0.103 | 0.005 (0.32) | 0.001*** |
| Duck | 0.004 (0.12) | 0.028 | 0.002 (0.05) | 0.014 | 0.002 (0.07) | 0.177 |
| Poultry | 0.087 (8.66) | 0.061 | 0.077 (7.70) | 0.047 | 0.01 (0.96) | 0.014** |

| Paired Differences | | | | 95% Confidence Interval of the Difference | | | |
|---|---|---|---|---|---|---|---|
| Men TLU | Women TLU | M.D | S.D | S.E.M | L | U | Sig |
| 1.712 | 0.221 | 1.491 | 1.799 | 0.090 | 1.314 | 1.668 | 0.000 |

S.D. – standard deviation, Sig – significance, TLU – tropical livestock unit, M.D. – mean difference, S.E.M. – standard error of the mean, L – lower, U – upper.
Number of observations = 400. Values in parenthesis represent species stock number.
***, ** and * represent significance at 0.01, 0.05 and 0.1 respectively.
Source: own elaboration.

respondents particularly noted that women often lack resources to stock and raise livestock. As stated by one woman during a focus group discussion, "it is beyond (our) financial strength to buy cattle and hire herdsmen (Fulani) to take care of our cattle, and so we make do with small ruminants and poultry". Another female respondent revealed that "we (women) do not own land and therefore cannot authorise the settlement of herders (Fulani) on any part of the community land to take care of our cattle".

Additionally, male respondents were emphatic in stating that: "women do not customarily inherit family livestock because they are expected to be married off by their paternal families". The respondents noted that "it was regular for women to acquire any livestock of their choice through other sources such as market purchase, gifts or government assistance but inconsistent with customs for women to inherit family livestock". Perceptions of gender-based ownership of livestock assets were rooted in the religious view that "the man is the head of the household and should provide for his family", as quoted by another male respondent to emphasize the reasons why men were expected to keep livestock of higher value to fulfil their obligation.

One of the many benefits of livestock is its contribution to household food expenditure. The study results presented in Table 5 below indicate that livestock's annual contribution to household food expenditure was 1,272.73 Ghana cedi (GH₵), representing 16.08% of annual food expenditure. Sex-disaggregated livestock assets contribution to household food expenditure indicates that men's livestock annual contribution was GH₵ 719.83, representing 9.14% of annual household food expenditure. The annual contribution of women's livestock assets to household food expenditure was GH₵ 479.70 while joint livestock assets contributed GH₵ 73.20, representing 6.04% and 0.90% of annual household food expenditure, respectively. In relative terms, men owned more livestock assets than women, so it was typical for men's livestock contribution to household food expenditure to be higher than that of women. However, when the livestock income proportion spent on food expenditure was analysed, the results revealed that women used 85.19% of their livestock income on household food expenditure while men spent 51.01%. Also, 64.89% of income from livestock owned jointly by men and women was spent on household food. Therefore, the difference in percentages of total livestock proceeds spent on household food was significant, with the percentages in the case of women-owned and jointly owned livestock exceeding those in the case of men-owned livestock. The result implies that the prospects of household members consuming livestock products and other food items bought with cash sales

**Table 5.** Annual livestock contribution to food expenditure in Ghana cedis

| | Annual Livestock Income | | | Contribution to household food expenditure | | |
|---|---|---|---|---|---|---|
| | Mean GH₵ | Std. Dev. | % spent on food | Mean GH₵ | Std. Dev. | % cont. to food |
| Men | 1 728.0 | 1 456.96 | 41.66 | 719.8 | 454.25 | 9.14 |
| Women | 554.6 | 467.41 | 86.5 | 479.7 | 372.23 | 6.04 |
| Joint | 85.2 | 260.71 | 86.0 | 73.2 | 206.85 | 0.90 |
| | Paired differences<br>95% confidence interval of the difference | | | | | |
| | Mean | SD | Std. Err Mean | Lower | Upper | Sig 2-tail |
| Women-Men | 34.19 | 26.75 | 1.34 | –36.81 | –31.56 | 0.000 |
| Joint-Men | 36.91 | 21.42 | 2.70 | –42.30 | –31.51 | 0.000 |
| Joint-Women | 3.04 | 18.44 | 2.32 | –7.69 | 1.60 | 0.195 |

Source: own elaboration.

of livestock and livestock products were significantly higher for women-owned and jointly owned livestock than men-owned livestock. This means that women viewed livestock income mainly as earnings for household food security, whereas men perceived livestock income more broadly – as earnings for general household welfare. These results are consistent with earlier research findings (Hjelm and Dasori, 2012).

As presented in Table 6 below, the binary logit regression model results showed that livestock assets inequality index (Gini) positively influences food insecurity, with a marginal effect of 0.007 at a 10% significance level. This means that a unit increase in the Gini index increases household food insecurity by 0.7%. These results are in line with earlier research findings (Njuki et al., 2014). The results further indicate that total livestock assets (measured in TLU) owned by household members had a significant positive impact on household food consumption and negatively influenced household food insecurity at a 5% significance level. The marginal effect of total household livestock assets was -0.031. This means that a unit increase in livestock assets (TLU) decreases household food insecurity by 3.1%, holding other factors constant. In other words, when a household owns a single cow (the equivalent of 1 TLU), its food insecurity decreases by 3.1%. This finding is consistent with prior expectations and confirmed by the results (Abafita and Kim, 2014). The regression estimates also indicate that farm size and education negatively impact household food insecurity. A 1-hectare increase in household farm size decreases household food insecurity by 12.1%, whereas an additional 1 year in formal education decreases household food insecurity by 4.9%, ceteris paribus. The result is consistent with earlier research findings that education positively influences food security (Bashir et al., 2012).

Also, large farm size is positively linked with food security (Gebrehiwot and van der Veen, 2014). The regression estimates also show that household size, dependency ratio, and sex of the household head positively influence food insecurity of households. The results indicate that an increase in household size by one person increases household food insecurity by 2.3%. In comparison, a similar increase in household dependency by one person increases food insecurity by 9%, all other things being equal. In addition, the average food

**Table 6.** Summary results of the logistic model

| Variable | Coef. / P>z | [95% Con. Int.] | | Marginal eff. |
|---|---|---|---|---|
| Gini | 0.300* (0.084) | –0.001 | 0.015 | 0.007 |
| Educ. | –2.171* (0.053) | –0.099 | 0.001 | –0.049 |
| HseSize | 1.011* (0.063) | –0.001 | 0.047 | 0.023 |
| FarmSize | –5.328** (0.034) | –0.232 | –0.009 | –0.121 |
| NfInc. | –0.001 (0.109) | 0.000 | 0.000 | 0.000 |
| Dep. | 3.993* (0.053) | –0.001 | 0.182 | 0.090 |
| HH TLU | –1.348** (0.044) | –0.060 | –0.001 | –0.031 |
| Age | –0.111 (0.101) | –0.006 | 0.000 | –0.003 |
| SoNwk. | 0.592 (0.409) | –0.016 | 0.039 | 0.011 |
| HHsex | 4.027* (0.063) | –0.023 | 0.877 | 0.427 |
| Cons | 1.040 (0.720) | –4.655 | 6.736 | |

Gini – livestock assets inequality index, educ. – number of years spent in school, HseSize – number of household members, FarmSize – size of cropped land in hectares (ha), NfInc – income from non-farm activities in (GH₵), Dep. – number of household dependents, HH TLU – household livestock in tropical units, Age – age in years, SoNwk. – 0 equal membership of an association, 1 = otherwise, HHsex – 0 equal male and 1 = female, Cons – Constant.
***, ** and * represent significance at 0.01, 0.05 and 0.1 respectively.
Source: own elaboration.

security of households headed by women decreased by 42.7% compared to households headed by males. Similar results were reported by Habyarimana (2015) that female-headed households are more vulnerable to food insecurity. Moreover, the finding that large household size is positively connected to food insecurity is in line with prior expectations and consistent with earlier findings (Gebre, 2012). Furthermore, the results indicating that the dependency ratio is strongly related to food security agreed with the earlier findings (Adepoju and Adejare, 2013).

## CONCLUSION AND RECOMMENDATION

While many locations and household-specific cases call for specific interventions, the study reiterates the argument that gender asset equality and equity are needed to ensure household food security and wellbeing, as well as to advance social justice. Therefore, the study recommends that development programmes target women's economic empowerment and education to bridge the asset gender gap and improve household food security. The government should also increase its commitment to education and agriculture through infrastructure and human resources investments to further improve household food security.

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