



Climate Resilience Through Dual-Purpose Crops for Small-Scale Dairy Farming in Benin

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Executive summary

- Dual-purpose crops have a high potential to simultaneously improve grain yields and livestock feed availability and quality.
- They provide food and income to households, while crop residues are an essential fodder source for livestock.
- The extension of dual-purposes crops must be based on its resistances to the climate parameters of the various regions:

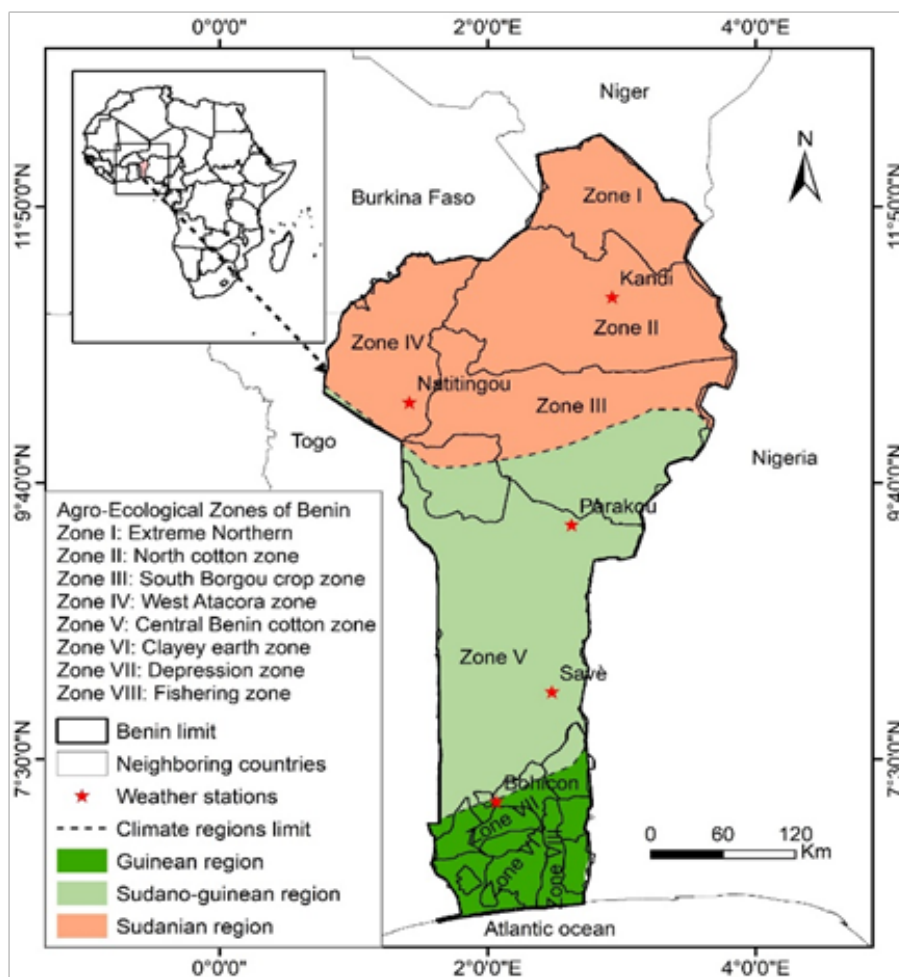
- In Guinean regions of Benin, dual-purpose cowpea and some varieties of dual purpose-maize should be promoted to dairy farmers, replacing dual-purpose sorghum, which is very affected by the climatic parameters of this region mainly humidity and rainfall.
- Some varieties of dual-purpose maize like BEMA10 B-05; 1-BE-F5P-15 and BEMA14 J-07 have a high tolerance to drought, even climate parameters (humidity, rainfall, temperature).
- In Sudano-Guinean and Sudanian regions, dual-purpose sorghum is more suitable and should be promoted and integrated among dairy farmers in this region.
- Dual-purpose Cowpea is favorable to the climate parameters of the Sudanian region. In addition, Dual-purpose cowpea seems to be more resilient to climate variations mainly some varieties (TN 88-63; IT 84 D 513; Kpodjiguèguè)
- Concerning the dual-purpose Peanut (*Arachis hypogaea* L.), only the variety ICGV 88274, could be recommended in Sudanian regions of Benin.

Context and importance of the problem

In response to livestock feed constraints, farmers are increasingly exploring new options to improve the productivity and efficiency of their crop-livestock enterprises (Snapp et al, 2018). One such option is dual-purpose crops, which has a high potential to simultaneously improving grain yields and livestock feed availability and quality (Erenstein, et al, 2013; Hassan et al, 2015). A promising method of enhancing crop and livestock productivity is increasing the availability and quality of cereal residues as livestock feed (Amede et al., 2009; Alkemade et al., 2012). Dual-purpose crops provide food and income to households, while crop residues are an essential fodder source for livestock (Tarawali et al, 2011; Salmon et al, 2018). Compared to grain-only crops, dual-purpose crops help to significantly improve the profitability, environmental sustainability, and resilience of the whole farm system (Tarawali et al, 2011). It is recognized that dual-purpose crops have positive effects on nutrition and adaptation to climate change. However, policy recommendations do not consider climate variability across the country and the tolerance of each dual-purpose crops to the various climate regions. This policy brief aims to share evidence for dissemination of appropriate use of dual-purpose crops on dairy farms across the various climate regions of Benin.

Dual-purpose crops can be used to overcome feed quality gaps observed in dry season with recurrent drought and dryness of grazing areas. These dual-purpose crops include cereal straws and leguminous haulms (Drabo et al., 2001). Although cereal residues are poor in nitrogen because they are mainly cellulose, they are increasingly used directly by animals on pasture or collected and stocked to supplement animals in the dry season. On the other hand, legume haulms are used to supplement the animals in the dry season. Legume haulms are higher content in protein (Savadogo et al., 1999) and have a higher energy concentration than cereal residues. They are an important source of animal supplementation in the dry season (Delma et al., 2016). These two types of dual-purpose crops residues can often constitute the daily ration for animals during the dry season (Cuvelier and Dufrasne, 2014). Also, this dual-purposes cropping system improves soil fertility and helps control weeds and climatic hazards (Matusso et al., 2014). Adjahossou et al (2013) showed that the groundnut-corn cropping association improves protein (24.1% to 106.2%) and lipid (147.9% to 386%) production in corn grain and fodder. Also, it's constitute a key to strengthening the resilience of small-scale dairy farmers to climate variability and the adverse impacts of environmental conditions (Kiéma et al., 2019). In West Africa, several studies have allowed the selection of improved dual-purpose varieties of graminaceous and leguminous plants with good fodder and grain performance (César and Guiro, 2004; Coulibaly et al, 2012a). Dual-purpose maize varieties for food and feed provides a promising technological option to intensify both crop and livestock production by simultaneously increasing the availability and quality of grain production and livestock feed (Berhanu et al., 2012; Blümmel et al., 2012). The potential of these dual purpose technologies would depend on the environment, i.e. agro-ecological, climate parameters and socio-economic context of agricultural production (Notenbaert et al., 2012), farm management, i.e. crop-livestock farming systems (Ojiem et al., 2006; Sharma et al., 2010). Furthermore, sorghum is an important food and feed source in mixed crop-livestock production systems where its dual usage is a preferred option, especially among the resource poor small-scale farmers (Chikuta et al, 2017). Cowpea (*Vigna unguiculata* (L.) Walp) is one of the most important food legumes and a valuable component of the traditional cropping systems in the semi-arid tropics (Singh et al., 2003). In Benin, the third largest producer of cowpeas in the world, cowpea is traditionally the main fodder crop. In this country, FAO (2008) estimates cultivation of cowpea on 5,294,700 ha and a production of 1,569,300 tons in 2008. Cowpea offers a valuable contribution towards human food as well as livestock fodder and due to this dual-purpose character, it is a very attractive crop (Singh et al., 2003).

Figure: Agro-ecological and Climate Region of Benin



Results and implications

Summary of the evidence

- Dual purposes crops yield are significantly affected particularly in some regions of Benin by climate parameters (Rainfall, humidity, and temperature).
- The variation of Humidity has a negative effect on dual-purpose sorghum yield in Guinean region
- The resistance of dual-purpose crops to climate variability and change revealed that The Annual Yield of dual-purpose maize is significantly influenced by Rainfall and Weather station/ Climate Region.

- The Annual Yield of dual-purpose peanut varied significantly with the Temperature and Humidity. Furthermore, Cowpea seems to be more resilient to climate variations.



Policy recommendations

Three policy recommendations emerge from these findings:

- First, the choice of dual-purpose crops to be extended in dairy farming must be made by climate region and according to the resistance of these crops to the climate factors of the region.
- Secondly, the choice of dual-purpose crops to be promoted must also consider the variety. Some varieties of maize and sorghum are very sensitive and should not be promoted even in regions known favorable to these cultures
- Finally, the government must update or review his agricultural policy by integrate climate regions, its variations and particularities.



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