

Research Application Summary

**Effects of cowpea leaf harvesting initiation time on yields and profitability of dual-purpose sole cowpea and cowpea-maize intercrop**

Mwanarusi, S.<sup>1</sup>, Itulya, F.M.<sup>1</sup>, Aguyoh, J.N.<sup>1</sup> & Owour, G.<sup>2</sup>

<sup>1</sup>Department of Crops, Horticulture and Soils, Egerton University, P.O. Box 536 Njoro-Kenya

<sup>2</sup>Department of Agricultural Economics and Agribusiness Management, Egerton University, P.O. Box 536, Njoro-Kenya

Corresponding author: mwanarusi@yahoo.com

**Abstract**

Dual-purpose cowpea production is a common component of many tropical and sub tropical subsistence farming systems. However, limited information exists on effects of leaf harvesting initiation time on yields and profitability of dual-purpose cowpea based cropping systems. This study investigated the effects of initiating cowpea leaf harvesting at different times on performance of sole dual-purpose cowpea and dual-purpose cowpea-maize intercrop. Initiating leaf harvesting at 3 and 4 weeks after cowpea emergence (WAE) resulted in highest leaf and grain yields, respectively among leaf harvested cowpea. Overall, cowpea grain yields were highest in control treatment. Yields were lower in intercrop than in monocrop treatments. Maize yields in intercrop treatments were improved following harvesting of leaves of the companion cowpea. Initiating leaf harvesting at 3 and 4 WAE yielded highest returns in cowpea-maize intercrop and sole cowpea, respectively. Intercropping was on overall more profitable than sole cropping.

Key words: Dual-purpose cowpea, leaf harvesting, profitability, yields

**Résumé**

La production du niébé à double usage est un élément commun à de nombreux systèmes agricoles de subsistance sous tropicales et tropicales. Cependant, peu d'informations existent sur les effets du temps d'initiation des feuilles de récolte sur les rendements et la rentabilité de niébé à double fin des systèmes de culture. Cette étude a examiné les effets de l'ouverture de la récolte des feuilles de niébé à différents moments sur le rendement du niébé à double usage unique et à double usage intercalaire du niébé-maïs. Le lancement de la récolte des feuilles à 3 et 4 semaines après la levée du niébé (WAE) a entraîné au plus haut des feuilles et des rendements des céréales, le niébé, respectivement chez les feuilles récoltées. Dans l'ensemble, les rendements en grains de niébé ont été plus élevés en matière de contrôle du traitement. Les rendements ont été

inférieurs en inter-culture que dans les traitements monoculture. Les rendements du maïs en culture du traitement d'insertion ont été améliorés après la récolte des feuilles de niébé. Le lancement de la récolte des feuilles à 3 et 4 WAE a donné le rendement le plus élevés en culture d'insertion du niébé-maïs et de niébé, respectivement. La culture d'insertion a été sur l'ensemble la plus rentable que la culture pure.

Mots clés: Niébé à double fin, la récolte des feuilles, la rentabilité, les rendements

## Background

Cowpea (*Vigna unguiculata* (L) Walp) is a major grain legume, fodder, green pod and leafy-vegetable crop grown on 12.5 million ha in drought-prone regions of Africa and other tropical and subtropical regions. It is mostly grown by small-scale farmers who practice intercropping in their small land holdings.

Grown as a monocrop or intercrop, these two main systems are commonly used in the production of cowpea. Where the crop is grown purely for vegetable production, the entire plant is uprooted at the 3–5 true leaf stage before the leaves become too mature and fibrous, or in the case of dual-purpose production, sequential leaf harvests are made during the vegetative stage of the crop, followed by seed harvesting at the end of the season. The latter system predominates with most subsistence growers who practice intercropping. The study determined the effects of cowpea leaf harvesting initiation time on yield and profitability of sole crop dual-purpose cowpea and dual-purpose cowpea–maize intercrop production systems.

## Literature Summary

Defoliation has also been shown to influence yield and profitability of crops. In cowpea, poor performance of the crop was observed for defoliation imposed in the vegetative stage and at 100% intensity but yield and economic performance of the crop was impressive for defoliation imposed in flowering stage and at 50% intensity (Rahman *et al.*, 2008). Profitability has been termed as the kingpin of any agricultural practice (Korir *et al.*, 2006). The kind of decision regarding the cropping and harvesting regime to be used will thus depend on the satisfaction or benefits expected from such activities.

## Study Description

The study used an unbalanced factorial experiment in a Randomized Complete Block Design with three replications. Factors studied were leaf harvesting initiation time and cropping regime. Leaf harvesting was initiated at three different times: 2,

3 and 4 weeks after emergence (WAE) of cowpea with a control treatment where no leaf harvesting was done. Cropping regime factor comprised of cowpea grown as a monocrop or cowpea intercropped with maize. Treatment application entailed manual picking of all young but fully expanded leaves from each vine. Leaf vegetable yield and cowpea and maize grain yields were measured. Profitability assessment was done by gross margin analysis.

Yield data were analyzed by analysis of variance (ANOVA) at  $P < 0.05$  using SAS and means separated using LSMeans statement of Proc Mixed at  $P < 0.05$ . Differences in profitability were determined by comparing gross margins obtained for the different leaf harvesting and cropping regimes.

### Research Application

Cowpea leaf vegetable yield was influenced by both leaf harvesting initiation time (LHI) and CR (Table 1). The interaction between LHI x CR was not significant. Initiating leaf harvesting at 3 WAE produced highest leaf vegetable yields in both seasons. Monocrop cowpea gave higher leaf vegetable yields than intercropped cowpea.

**Table 1. Effects of cowpea leaf harvesting initiation time (LHI) on leaf vegetable yield of cowpea (kg/ha) under different cropping regimes (CR).**

LHI (Weeks after emergence)	Cropping regime (CR)		
	Monocrop	Intercrop	LHI Means
<b>Season 1</b>			
No	-	-	-
2 WAE	1822.1*	1733.4	1777.8 c**
3 WAE	2521.0	2236.2	2378.6 a
4 WAE	2270.5	2068.1	2169.3 b
CR Means	2204.6 f**	2012.6 g	
<b>Season 2</b>			
No	-	-	-
2 WAE	1204.9*	946.6	1075.8 a*
3 WAE	1554.3	1312.7	1433.5 a
4 WAE	1352.7	1146.2	1249.5 a
CR Means	1370.6 d**	1135.2 d	

\* Season x leaf harvesting initiation time (LHI) interaction is not significant according to the F Test ( $P < 0.05$ ).

\*\* Within season, means followed by the same letter in a letter series are not significantly different ( $P < 0.05$ ).

Cowpea grain yield was significantly affected by LHI and CR (Table 2). Harvesting cowpea leaves at the vegetative stage of the plants significantly lowered cowpea grain yields compared to the control. Initiating leaf harvesting at 4 WAE resulted in

**Table 2. Effects of cowpea leaf harvesting initiation time (LHI) on grain yield of cowpea (kg/ha) under different cropping regimes (CR).**

LHI (Weeks after emergence)	Cropping regime (CR)		
	Monocrop	Intercrop	LHI Means
<b>Season 1</b>			
No	2804.6*	1560.0	2182.3 a**
2 WAE	1313.1	831.6	1097.4 c
3 WAE	1535.3	1451.8	1518.6 b
4 WAE	2133.4	1508.3	1820.9 b
CR Means	1959.1 f**	2012.6 g	
<b>Season 2</b>			
No	1302.8*	855.4	1079.1 a**
2 WAE	734.0	423.6	577.8 c
3 WAE	833.8	478.4	656.1 c
4 WAE	1112.1	559.4	835.7 b
CR Means	995.2 f**	579.2 g	

\*Season x leaf harvesting initiation time (LHI) interaction is not significant according to the F Test ( $P < 0.05$ ).

\*\*Within season, means followed by the same letter in a letter series are not significantly different ( $P < 0.05$ ).

**Table 3. Effects of cowpea leaf harvesting initiation time (LHI) on grain yield of maize (kg/ha) of a cowpea-maize intercrop.**

Cropping regime	Season 1	Season 2
Monocrop	3230.1 a**	2025.6 a
Intercrop No	1380.5 d	727.1 c
Intercrop 2 WAE	1599.4 cd	1232.7 b
Intercrop 3 WAE	1879.5 b	1209.8 b
Intercrop 4 WAE	1684.9 bc	1106.8 b

\*\*Within a column, values followed by the same letter column are not significantly different.

highest cowpea grain yield among leaf harvested cowpea, with the lowest grain yield obtained when leaf harvesting was initiated at 2 WAE.

Growing maize as a monocrop resulted in the highest grain yields (Table 3). Harvesting leaves of the companion cowpea crop resulted in an improvement in maize yields compared to when the companion cowpea was not harvested.

In both sole and intercropping regimes, profitability was influenced by cowpea leaf harvesting initiation time. Harvesting of cowpea leaves for use as leaf vegetable improved profitability of both cropping regimes except when leaf harvesting was initiated at 2 WAE in sole crop cowpea.

<b>Recommendation</b>	Growers of dual-purpose cowpea vary leaf harvesting initiation time depending on their production goals.
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