INTEGRATION OF FORAGE LEGUMES INTO MAIZE/ELEPHANT GRASS SYSTEMS FOR DAIRY FARMING

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ABSTRACT
The livestock sector contributes about 30% of the total value of agricultural production but the sector does not meet the demand for milk. Currently, there is serious migration of the rural population to urban centres and this will lead to high demand for milk and milk products. Therefore, the development of peri-urban dairy production by the small scale farmers appears a promising option to solve the problems of malnutrition, increase household incomes and improve the quality of life of these farmers. The dominant production system practised is zero-grazing using improved dairy breeds and feeding elephant grass (*Pennisetum purpureum*) with limited forage legume component. This has tended to lead to low milk production. The general objective was to integrate appropriate forage legumes into maize and elephant grass/livestock farming systems in order to improve feed quality and quantity and hence milk production. The paper presents data on compatibility of three forage legumes undersown into maize and also a conceptual model of the system under study.

KEYWORDS
forage legumes, maize/elephant grass, fodder, dairy farming

INTRODUCTION
The livestock sector contributes about 30% of the total value of agricultural production but the sector does not meet the demand for milk and milk products. The population of Uganda, now about 17 m people with a growth rate of about 3% per annum, has more than doubled in the last 20 years, and the demand for food of high nutritional value is also increasing. Currently, there is serious migration of rural population to urban centres and this will lead to high demand for milk and milk products. Therefore, the development of per-urban dairy farming by the small scale farmers appears a promising option to solve problems of malnutrition, low household incomes and poor quality of life of these farmers. This group is largely dominated by resource-poor farmers, mainly, women, who own on average 2.6 dairy cows and depend (100%) on low quality elephant grass (*Pennisetum purpureum*) for feeding their animals under zero-grazing systems. During the dry season the quantity is also limiting as these farmers own between 0.5-5 ha of land and use the same land to grow food crops such as maize. The farmers have also reported declining productivity of elephant grass in terms of fodder with repeated defoliation. Elephant grass is also known to deplete soil fertility, in particular, Nitrogen (Zake, 1992). However, due to poor management and the lack of high quality forage legumes in their production systems, milk production is considerably below the genetic potential of the exotic animals they keep. The seasonal fluctuation in feed supply reduced lactation periods from 10 months to 7 months. This gap could be bridged by introducing forage legume species which are highly productive in terms of fodder, nutritive value and persistence (Tothill, 1985). The general objective was to integrate appropriate forage legumes into maize and elephant grass/livestock farming systems in order to improve milk production in the peri-urban areas thus improving the quality of life of the small scale farmers through increased household incomes. This paper presents part of the results of the ongoing research programme funded by Rockefeller Foundation.

MATERIALS AND METHODS
The research is based in the peri-urban areas of Kampala and focuses on small scale dairy farmers for milk production for sale. A rapid rural appraisal was first carried out to determine the farming practices in this region. Also, a conceptual diagram of the system has been developed. The dominant farming practice (zero grazing) as revealed by the RRA used by these farmers was studied with the view of introducing forage legumes to improve milk production as well as sustaining fodder production. Three forage legumes (*Macroptilium atropurpureum*, *Centrosema pubescens* and *Stylosanthes guianensis*) seasons were planted in maize on the station at Makerere University Agricultural Research Institute, Kabanyolo (MUARIK) for two growing seasons in 1993 and 1994 to assess compatibility in terms of DM fodder production and grain yield.

RESULTS AND DISCUSSION
The data in Table 1 indicate comparative yields of grain and fodder (stover and legume) as influenced by undersowing forage legumes into maize. *Centrosema pubescens* and *M. atropurpureum* were more compatible with maize than *S. guianensis* as reflected by higher yields of grain and fodder. Part of the increased grain yield is expected to feed the livestock resulting in more milk production with the rest going to the household, thus solving food security problems as indicated in the conceptual model (Figure 1). The conceptual model further shows the expected outcomes when various pathways will be studied.

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Table 1
Total maize grain yield[1] (t/ha) and fodder production (t/ha) of maize undersown with forage legumes at MUARIK, Uganda.

Maize/Forage System	Grain yield	Stover	Legume
Maize + *S. guianensis*	2.6	10.4	2.5
Maize + *C. pubescens*	4.8	12.7	3.6
Maize + *M. atropurpureum*	5.5	15.7	3.8
Maize alone	2.9	11.3	-

[1] Total yield of 2 growing seasons

Figure 1
A conceptual model indicating various pathways that are thought to increase sustainability and productivity of the forage legume & crop/ livestock farming systems under the small holder peri-urban dairy production sector.