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Research Application Summary

The contribution of women to food and fodder production in war affected areas of Gulu District in Uganda

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Abstract

Smallholder women dairy cattle farmers in war affected areas of Gulu district in Northern Uganda play a pivotal role in food and fodder production. The major constraint to improved cattle production is feed shortage resulting in a reduction in food (milk and grain) and nutrition security in addition to increased labour burden, reduced household welfare and poverty. A study was therefore conducted to evaluate the effect of integrating *Lablab purpureus* (lablab) into sorghum cropping system in Gulu district, and identify women's role in food and fodder production and constraints to adoption of food-fodder technologies. Intercropping sorghum with lablab improved plant height (10.5%); total sorghum stover yield (14.2%); sorghum grain (5.8%) and crude protein content of sorghum stover (50%) compared to sorghum monocrop (133,0 cm; 1,446 and 1,239 kg/ha/season, respectively). Sorghum-lablab technology had significantly larger gross margin per season (US $ 206) with lower cost of weeding the fields (US $ 200) than sorghum monocropping system (US $ 96 and US $ 300, respectively). Lablab controlled weeds and reduced labour requirements for weeding. Sorghum-fodder technology is therefore important to resource poor dairy farmers in war affected areas because it improves fodder production to fill the feed gap during the dry season while improving sorghum grain yield from the same piece of land. Results of a technology evaluation survey showed that women farmers identified: lack of capital (100% of the respondents), inadequate land (100%, n=100) and long drought (98%) and unavailability or high cost of labour (96%) as major constraints to adoption of sorghum-lablab intercropping system in war affected areas of Gulu district. Women contributed over 50% of the labour for fodder and food production. Researchers and development workers are challenged to introduce labour-saving husbandry practices in war affected areas of Northern Uganda.

Key words: Food and feed production, *Lablab purpureus*, sorghum, war affected areas

Résumé

Les femmes agriculteurs de petites exploitations de bovins laitiers dans les régions touchées par la guerre du district de Gulu en Ouganda du Nord jouent un rôle essentiel dans la production alimentaire et celle de fourrage. La contrainte majeure à la production améliorée de bétail est la pénurie d'aliments résultant en la sécurité alimentaire (lait et céréales) et la sécurité nutritionnelle en plus de charge de travail accrue, une réduction du bien-être des ménages et la pauvreté. Une étude a donc été menée pour évaluer l'effet de l'intégration de *Lablab purpureus* (lablab) dans le système de culture du sorgho du district de Gulu, et d'identifier le rôle des femmes dans la production alimentaire et celle de fourrage et les obstacles à l'adoption de technologies agro-alimentaires et de fourrage. Intercaler le sorgho avec le lablab a amélioré la hauteur des plantes (10,5%); le rendement total de biomasse du sorgho (14,2%); les grains de sorgho (5,8%) et la teneur en protéines brutes de la paille de sorgho (50%) par rapport à la monoculture de sorgho (133,0 cm; 1446 et 1239 kg / ha / saison, respectivement). La technologie sorgho-lablab avait nettement plus de marge brute par saison (206 $ US) à moindre coût du désherbage des champs (200 $US) que le système de monoculture du sorgho (96 US $ et 300 US $, respectivement). Lablab a contrôlé les mauvaises herbes et a réduit les exigences du travail pour le désherbage. La technologie sorgho-fourrage est donc importante aux fermiers laitiers pauvres en ressources dans les régions touchées par la guerre, car elle améliore la production de fourrage pour combler le déficit alimentaire pendant la saison sèche, tout en améliorant le rendement en grains de sorgho de la même parcelle de terre. Les résultats d'une enquête d'évaluation des technologies ont montré que les femmes agriculteurs ont identifié: le manque de capital (100% des répondantes), l'insuffisance des terres (100%, n = 100) et une longue sécheresse (98%) et l'absence ou le coût élevé du travail (96%) comme des obstacles majeurs à l'adoption du système de culture intercalaire sorgho-lablab dans les régions touchées par la guerre du district de Gulu. Les femmes ont contribué à plus de 50% de la main-d'œuvre pour les fourrages et la production alimentaire. Les chercheurs et les agents de développement sont appelés à introduire des pratiques d'élevage à économie de travail dans les régions touchées par la guerre du nord de l'Ouganda.

Mots clés: aliments et production alimentaire, *Lablab purpureus*, sorgho, régions touchées par la guerre

Background

For close to 22 years Northern Uganda experienced an armed conflict between the Lord Resistance Army (LRA), and the Government of Uganda. The conflict claimed a lot of lives and displaced many people from their homes, besides devastating social services and physical infrastructure in the region. In virtually all the districts which form the northern region that were affected by this insurgency, there was massive displacement to the extent that in some of the districts such as Gulu, over 90% of the population was displaced; 30% of the woman are survivors of gender-based violence and/or sexual assault, and about one to ten women live with HIV/AIDS (Immanuel, 2010). In particular, women and girls have been the target of violent acts such as abduction, rape, mutilation, maiming and killing (UNICEF, 2005). Despite the various difficulties women have faced during the prolonged insurgency, they have continued to demonstrate resourcefulness in the way they have been able to organise themselves in the midst of crises and supported their families economically. One indicator of women's economic initiative is the number of activities being undertaken by individual women or groups of women in the form of self-help projects. These include dealing in agriculture and livestock production. These efforts provide households with the means to acquire other essential consumer items and food to feed the family.

Gulu Women Dairy Heifer Project (GWDHP) was started in 1997. In 2004, the members of the group received 99 in-calf heifers from USAID through Heifer Project International (HPI). The animals have multiplied to about 300 cows (Odwar, 2010. personal communication). Members of the group pass on first female offspring of each animal received. Through the mechanism of 'passing on the gift', each participating farmer is required to pass on the first female offspring to another needy family that is trained in practical animal husbandry techniques. Women have made use of the group to acquire some skills in income generating activities as well as fending for their malnutrished children.

In war affected areas of Uganda, dairy cattle depend on poor quality pastures and crop residues that are usually in short supply and of poor nutritive value during the prolonged dry season (Kabirizi, 2009). Protein supply is critical, particularly in the dry season resulting in a reduction in food (milk and grain) and nutrition security in addition to increased labour burden, reduced household welfare and poverty. Increasing the resettlement

schemes for displaced people has led to a rapid and general decline in land available to smallholder farmers to produce food and fodder. Therefore, the need to intensify and optimise both crop and livestock production is a major challenge being faced by smallholder farmers. The objectives of the study therefore, were to:

a) evaluate the effect of intercropping sorghum with *Lablab purpureus* on sorghum grain and stover production;
b) assess women's role in production of food-fodder technologies; and,
c) identify constraints that could affect adoption of food-fodder technologies in war affected areas of Uganda.

Study Description

The study was conducted in four sub-counties in Gulu district, located in Northern Uganda. The district lies 332 km north of the capital of Kampala and consists of four counties. It shares borders with seven other districts as well as Sudan. About 10,301 sq km is under agriculture but insecurity has rendered big chunks of the district no-go areas. The major staple foods are finger millet, sweet potatoes, cassava, sorghum, pigeon peas, beans, bananas, cowpeas, soy beans and maize. About 90% of the population in the district engages and benefits from agriculture which contributes 45% of the Gross Domestic Product (GDP).

During the hostilities between government forces and the rebels there were many Internally Displaced Peoples' (IDPs) camps throughout the area, where at one time, an estimated one million people lived. Effective April 2009, all IDP camps were closed and the people were allowed to return to their villages. In July 2009, an estimated 1,452,000 (80.7%) IDPs out of a total of 1,840,000 had voluntarily left the camps to return home, leaving only 388,000, who are in the process of vacating or permanently settling where they are.

Selection of farmers, experimental design and treatments. Twenty households belonging to GWDHP were selected to participate in on-farm trials to evaluate food-fodder technology. Selection of farmers was based on: i) availability of land and labour to plant and manage the food-fodder fields, and ii) willingness to allow other farmers to visit the demonstrations fields. Farmers were trained on improved crop and livestock management techniques. *Lablab purpureus* (lablab) was introduced into sorghum (variety *Sekedo*) cropping systems and managed using methods described by Kabirizi (2009). Another

10 households were selected where no lablab was introduced into sorghum crop. Data were collected on sorghum grain and stover yield. Samples of sorghum stover and lablab foliage were taken, weighed and analysed for crude protein content using A.O.A.C (2001) methods. The study lasted two seasons.

Participatory technology evaluation survey. A participatory technology evaluation survey was conducted at the end of the study to assess the benefits and constraints from improved food-fodder technology to the production system and household welfare. Structured questionnaires (pre-tested) through interviews were used to collect data on constraints and benefits that would influence adoption of improved food-forage technologies in war affected areas in Uganda. The data were analysed using the Statistical Package for Social Scientists (SPSS) 11.0 for Windows (SPSS 2001). Means, ranges, standard deviations, frequencies and percentages were used to define the quantitative status of the data collected.

Economic analysis. The current market prices at the study time were used to compute the cost of inputs and labour. Income was derived from quantities of sorghum stover and grain produced and their respective prices. The gross margin for each treatment was calculated based on total cost of production and total income. Data on sorghum-lablab intercrop are presented in this paper.

Results and Discussion

Effect of intercropping sorghum and *Lablab purpureus* cv Rongai on herbage yield and quality of sorghum. Intercropping sorghum with lablab improved plant height by 10.5%, total sorghum stover yield by 14.2% and sorghum grain by 5.8%. Integrating lablab in sorghum cropping systems improved crude protein content of sorghum stover by 50% (Table 1).

Table 1. Effect of intercropping sorghum and *Lablab purpureus* cv Rongai on stover and grain production and household income

Parameter	Sorghum monocrop	Sorghum-lablab intercrop	SEM
Plant height (cm)	133.0[b]	134.4[a]	0.5
Total dry matter (DM) stover yield (kg/ha)	1,446[b]	1,652.1[a]	297
Legume yield, kg/ha	0	506.1	312
Legume Prop[1]	0.0	0.35	0.04
Sorghum grain yield (kg/ha/yr)	1,239[b]	1,311[a]	0.65
Crude protein (% DM)	4.4[b]	6.6[b]	13

Legume Prop[1] =Legume as proportion of total dry matter; SEM= standard error of Least square (LS) mean; Row LS means with different superscripts are significantly different at $P < 0.05$.

The higher growth rate of sorghum plants and total fodder DM yields in intercrops compared to monocrops could be attributed to the presence of lablab that improved plant growth. Lablab provided a soil cover reducing water loss from soil by evaporation and minimizing the effects of weeds in the intercrops. However, improved total fodder DM yields in the intercrops could also have been due to additive and complementary effect of a forage legume and sorghum that raised the productivity per unit of land. Therefore, higher total fodder DM yield in intercrops was not only due to higher total (lablab + sorghum) plant population densities but also to yield advantages that accrued basically from a lower competition and edaphic space in monocrops.

Intercropping improved crude protein content, as compared to sole sorghum crop protein yields. The legume improved the protein content to meet maintenance requirements and production in the stover (71-100 g/kg DM). This increase in protein content implies that a reduction in protein concentrate use is possible if such forages are conserved for the dry season feeding of dairy animals.

Profitability of food-fodder technology. A simple economic analysis carried out on the effect of integrating forage legumes in sorgum cropping systems and the results are presented in Table 2.

Table 2. Typical smallholder sorgum-lablab enterprise performance in Gulu district.

Activity (per household per season)	Sorghum-Lablab intercropping	Sorghum mono-cropping system
Land preparation per season (1 ha)	110	110
Cost of sorghum seed (12 kg/ha/season x US $ 1.14 per kg)	14	14
Cost of lablab seed (12 kg/ha @ US $ 3)	36	0
Planting sorghum (per ha)	50	50
Planting lablab (per ha)	20	0
Weeding	200	300
Harvesting, drying and conserving stover	150	100
Total cost of production	580	574
Estimated revenue per farm per season		
Sorghum grain (US $)	655	550
Stover as a feed resource (kg)	131	120
Total income (US $)	786	670
Gross margin (US $)	206	96

1 US $ = 2,200 Uganda shillings.

Farmers used family labour to prepare land, plant and weed the fields. Weeding accounted for about 52% of the total cost in sorghum monocrops as compared to 34% in intercrops. Lablab acted as cover crop, controlled the weeds and therefore reduced the cost of weeding in intercrops.

Based on results of the study (Table 2), it can be concluded that the additional returns generated under sorghum-lablab intercrop are greater than additional cost involved. The economic benefits therefore justify the additional costs of integrating forage legumes into sorghum cropping systems. Sorghum-forage legume technology is important to resource poor dairy farmers in war affected areas because it improves fodder production to fill the feed gap during the dry season while improving sorghum grain yield from the same piece of land.

Major constraints to food-fodder production in war affected districts of Uganda. Results of a technology evaluation survey showed that the major constraints to food-fodder production in war affected areas of Gulu district were: lack of capital, inadequate land and long drought that affected food and forage crop production (Table 3).

Table 3. Percentage households for constraints associated with use of improved forage technologies.

Constraint	Percentage of respondents (n=100)
Inputs	85
Drought	98
Lack of capital	100
Inadequate land	100
Lack of knowledge	75
Labour	96

Other constraints mentioned were lack of knowledge and high cost of inputs. The constraints mentioned above affected small-scale farmers' differently. The majority of farmers mentioned land (100 % of the households), lack of capital (100%), drought (98%) and high labour cost (98%) as their main problems. About 75 % of the households indicated knowledge as a constraint. Comparable to findings of this study, a review of several studies by Kabirizi (2006) cited lack of capital, land shortage and shortage of labour as major constraints to adoption of forage technologies. Constraints on any of the factors of production such as land, labour and capital can inhibit uptake of

technologies. Such constraints are severe especially among the resource-poor smallholder dairy cattle farmers in war affected districts of Uganda for whom food-fodder technologies are most needed.

Lack of inputs. The key inputs limiting adoption were shortage of implements, planting materials/seeds and fertilisers. Farmers rarely collected or used seeds from their own farms or from their neighbours, as they still expected the seeds from projects, government and non-governmental organisations. Efforts should be made to overcome this constraint by training farmers and farmer groups on multiplication, and encouraging them to produce and use their own seeds. This can enable farmers to produce seed commercially to meet their requirements as well as that of external markets.

Lack of capital. Abduction has had an adverse impact on the quantity of employment available to women and, as a consequence, diminishes their gross income. The majority of farmers could therefore not afford to raise enough capital to purchase the required inputs (such as hoes, implements and fertilisers) and later meet the labour costs required to manage the fields. Access to credit for purchasing inputs plays a crucial role in the development and adoption of new technologies and improve feed resources especially in low-income households such as those found in war affected areas of Uganda. However, many women were not keen to apply for credit because they either lacked collateral or did not want to risk their assets (cattle, land, etc.) being sold for defaulting. Therefore, there is also need to redefine the target group from all resource poor farmers, many of whom are usually risk-averse, own small pieces of land and have little cash reserves for new initiatives.

Lack of knowledge. Lack of knowledge was among constraints acknowledged by smallholder dairy farmers in Gulu district. After forage seeds are given to farmers by fellow farmers they do not know what is best to do with them or how to use them efficiently. Establishment of effective training-research-extension-farmer and stakeholder linkages can alleviate this constraint. Field days, demonstrations, educational tours and training workshops can improve knowledge of farmers on food-fodder based technologies.

Shortage of labour. The division of labour and gender roles in food-fodder production activities in smallholder dairy systems

in Gulu district is shown in Figure 1. Major source of labour was family labour. No hired labour was used in all farms visited because of lack of capital to pay for labour.

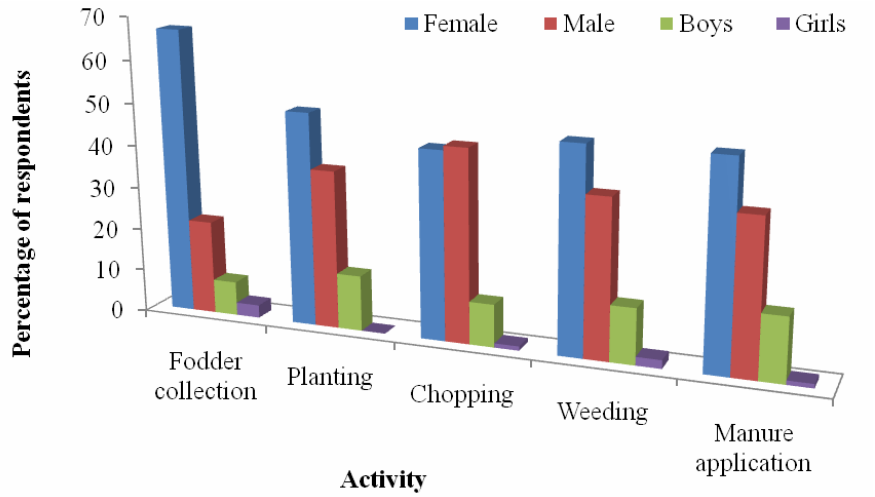

Figure 1. Division of labour in fodder production activities in smallholder dairy systems in Gulu district.

Different family members were responsible for different tasks. In over 50% of the households, fodder collection, planting, chopping, weeding and fertilizer application were done by women Overall, male involvement in all households was centred on monetary transactions and crisis situations demanding external assistance, such as calling for veterinary assistance or transporting and marketing of livestock and livestock products. Conflicts generally lead to the displacement and abduction or enlistment of young and energetic youths who would provide cheap labour. In northern Uganda in particular, there has been a reduction in the number of the predominantly agrarian population due to abduction, displacement or killings associated with the insurgency. As the farming populations flee, there is invariably decline in number of those farming, and widespread conflict-related food deficits is experienced during and long after the war has ceased. Even after resettlement in camps, the effective time spent on farming activities is often reduced as farmers have to trek long distances to their farmlands, for instance, in Gulu district, the displaced population worked on an average of only 7 days a month (Okot, 2009). In other circumstances, their health deteriorates due to poor nutrition or other diseases.

Land shortage. Land shortage was identified as one of the factors affecting adoption of food-fodder technologies in Gulu

district. The conflict in Northern Uganda imposed a great deal of disastrous effects in the region including displacement, destruction of social services, physical infrastructure and people's livelihoods. In the context of such effects on women's land rights, the displacement and long stay in the camps bred incidences that have affected women's access and use of land in the return process. Widows, divorced/separated women, and orphans could not go back to their former villages because they had been denied access to land. As a result quite a number of people are still stuck in the camps and have nowhere to go. Others are too old or frail or lack the means to travel back to their villages.

The other challenge for women's access to land has been exacerbated by the land conflicts that have become sporadic in the district. Although it has been reported that by August 2006, close to 900,000 of the total estimated IDP population of 1.8 million had returned to their original villages, and some 460,000 had made initial movement to transit sites, smaller camps closer to return areas (Oxfam 2008), the journey back home has been engulfed in a lot of difficulties and dilemmas regarding land. According to responses from group interviews in the camps, many people could not trace their land given the time they spent in the camps. Many went to the camps when young or were born in the camps and also married and had children in the camps but whose parents, relatives and friends died in the process. Such people are facing difficulties in tracing their land or homes. Others who had managed to return had difficulties tracing their land boundaries, some people who had gone back home found their land encroached upon by those who went back early. And, some are selling land without the awareness of family or clan members. This has become common among young men who do not want to go back to the villages, and instead prefer to stay in urban areas. And since some of these camps have become trading centres, many of them prefer to stay in the camps than go back to villages where people are scattered from each other. Participants in group discussions reported that some people had found their land already cultivated by unknown individuals. Yet in others, land was still occupied by government soldiers in form of army detach.

Conclusion

The study revealed that food and fodder yield of sorghum-lablab intercrop was much higher than in the monocrop. Apart from increase in nutrient composition, intercropping assists in minimizing protein concentrate costs and conserving soil-without

commercial nitrogen fertilizer. Lablab has the potential to be used for forage production in intercropping systems. Therefore, farmers are advised to use cereal-legume intercrops to enhance dry season feed availability. These intercropped forages can be harvested during the rainy season or dry season if they are irrigated and conserved as silage for dry season feeding to enhance viability and sustainability of smallholder dairy production in war affected areas of Uganda.

From the results of the study, it was concluded that women's contribution to food and feed security in the war affected areas of Uganda was very high. Since the application of food-fodder technologies is the key to intensification and increase to output of smallholder dairy cattle production systems, government and other stakeholders should support smallholder dairying by extending resource to poor farmers. This should be executed through participatory approaches to achieve widespread and long-term benefits of adopting food-fodder technologies for sustainable smallholder dairy production in Gulu district.

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