

Research Application Summary

Factors influencing on-farm common bean productivity in Manyara region in Tanzania

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Abstract

Common beans (*Phaseolus vulgaris*) are an important food and cash crop in developing countries. In Tanzania, different common bean varieties are grown by many farmers. However, productivity of all common beans is still far below the potential and this has impacted on profitability. The objective of this study was to establish factors influencing on-farm profitability of common beans amongst smallholder bean farmers in Babati District, Manyara Region in Tanzania. Multistage sampling was used to select respondents from the four divisions in Babati district (Babati, Gorowa, Mbugwe and Bashnet). The first stage involved a purposive selection of two divisions from the four divisions mentioned. The second stage entailed the selection of six wards from the two divisions, four from Bashnet division and two from Babati division. The fourth stage entailed purposive selection of nine villages from the six wards basing on bean production dominance. Then the final stage employed systematic sampling technique to select 200 bean farmers from the nine villages. Primary data were collected from the field using a structured interview schedule method. Secondary data were obtained from published literature from Babati District Council, Sokoine National Agricultural Library and Egerton University main library. Smallholder farmers' gross margin as a proxy of profitability was analysed using Gross Margin Analysis procedure. Multiple Regression Analysis was used to analyse factors affecting on-farm farmers' gross margin. The study results showed that at farm level, an average gross margin of TZS 311,483.56/= (US\$148.33) was generated per farmer per season. Farm-gate price, yield, gender, farming experience and off-farm income affected the gross margin realized by smallholder farmers.

Key words: Babati, common bean, improved variety, profitability, Tanzania

Résumé

Le haricot (*Phaseolus vulgaris*) représente une culture alimentaire et commerciale importante dans les pays en voie de développement. En Tanzanie, plusieurs variétés de haricot sont cultivées par les agriculteurs. Toutefois, la productivité des toutes ces variétés est encore bien en dessous du potentiel, avec un impact conséquent sur la rentabilité. Le but de cette étude est de déterminer les facteurs influençant la rentabilité du haricot des agriculteurs dans le district de Babati dans la région Manyara de Tanzanie. Un échantillonnage en plusieurs étapes a été utilisé pour sélectionner des enquêtés à travers quatre subdivisions

du district de Babati (Babati, Gorowa, Mbugwe et Bashnet). La première étape a consisté à une sélection ciblée de deux des quatre subdivisions. La deuxième étape a consisté à choisir six quartiers des deux subdivisions pré-sélectionnées, quatre de la subdivision Bashnet et deux de la subdivision Babati. A la quatrième étape, neuf villages ont été sélectionnés à partir des six quartiers en se basant sur l'intensité de la production du haricot. A la dernière étape, une technique d'échantillonnage systématique a été utilisée pour sélectionner 200 cultivateurs de haricots des neuf villages. Des données primaires ont été collectées sur le terrain en utilisant une méthode d'interview structurée. Des données secondaires ont été extraites des bases de littérature, existantes dans les bibliothèques d'Agriculture Nationale de Sokoine et de l'Université d'Egerton. La marge brute des petits exploitants a été utilisée comme approximation de la rentabilité, et évaluée en utilisant la procédure d'analyse de la marge brute. Une régression multiple a été utilisée pour évaluer les facteurs influençant la marge brute des agriculteurs. Les résultats de l'étude ont montré qu'au niveau exploitation agricole, une marge brute moyenne de TZS 311483,56 / = (US \$ 148,33) a été générée par agriculteur et par saison. Le prix à la ferme, le rendement, le sexe, l'expérience agricole et le revenu hors ferme ont tous influencé la marge brute réalisée par les petits agriculteurs.

Mots clés: Babati, haricot, variété améliorée, rentabilité, Tanzanie

Background

Agriculture plays an important role in the economic growth and development of a vast majority of developing countries including Tanzania (WTO, 2000). The sector contributes almost a quarter of Gross Domestic Product (24.1%) and employs 75% of the active labour force in Tanzania (Economic Survey, 2011; URT, 2013). Amongst the important agricultural subsectors in Tanzania are livestock, fishery, agro-forestry and crops (URT, 2013). The major food crops in the country include maize, sorghum, millet, rice, wheat, cassava, potatoes, bananas and legumes (OECD/ADB, 2012). The principal export crops include coffee, tea, cotton, cashew nuts, sisal, oil seeds, horticultural crops, pyrethrum, fresh cut flowers, cloves and spices (UNESCO, 2011).

Legumes represent an important component of agricultural food crops in developing countries as they complement cereal crops as a source of protein and minerals especially in Sub-Saharan Africa (Akibode, 2011). Grain legumes also serve as rotation crops with cereals, supplying nitrogen to the cereal crop (Beebe, undated). Food legume crops are considered vital crops for achieving food and nutritional security for both poor producers and other consumers (ICRISAT, 2012). Food legumes also play an important role as a source of animal feed in smallholder livestock systems (ibid). Food legumes moreover have higher prices, compared to cereals, and are increasingly grown to supplement farmers' incomes (Gowda *et al.*, 2009; Giller, 2012). One of the important legume crops grown in Tanzania is common bean (*Phaseolus vulgaris* L.). Common bean is the most important food legume for direct consumption and as a source of farm income in Tanzania (NBS, 2012). In the country, beans are generally cultivated by smallholder farmers often without the use of fertilizers. One quarter to one-third of the households sell their beans

(Ndakidemi *et al.*, 2006) and about 20% of the crop is marketed (FAO, 2005). Common bean is a popular crop among small-scale farmers because beans are a short duration crop (2.5 - 4 months) which permits production even when rainfall is erratic (CIAT, 2008). This shortens the hunger periods as well as providing quick cash (*ibid*). The average bean productivity in Tanzania is around 662 kg/ha (Ndakidemi *et al.*, 2006). However, the potential productivity under reliable rain-fed conditions, using improved varieties under proper crop and land husbandry is 1,500–3,000 kg/ha (*ibid*).

In Manyara region, beans dominate the production of pulse crops (URT, 2003). The production of beans among other legumes is much higher in Babati than in other districts in the region. The area planted to beans using improved seed is more than 41,000 ha, which represent more than 15% of the total planted area with annual crops and vegetables (URT, 2013). The number of households in Manyara who were reported to be selling common bean in 2010/2011 season was 88,121, representing 58.6% of the total number of crop growing households (NPS, 2011). The percentage of crop growing households that sell beans was highest in Babati (81%) followed by Kiteto (55%), Hanang (52%), Mbulu (48%), and Simanjiro at 23% (*ibid*). The objective of this study was to establish factors influencing on-farm profitability of common beans amongst smallholder bean farmers in Babati District, Manyara Region in Tanzania.

Study description

The study was carried out in Babati District of Manyara region in Tanzania located at 4°14'08.2"S 35°30'46.0"E. The region was chosen because of its high potential in grain legumes production. The main economic activities in Manyara Region are agricultural production, livestock keeping and mining. Agricultural production is dominated by peasant farming. The major food and cash crops that are cultivated by smallholder farmers include maize, food beans, pigeon peas, sunflower, onions, garlic, coffee, paddy and finger millet (URT, 2003).

The sample size was 200 farmers drawn from a population of common bean smallholder farmers with less than or equal to two hectares under common bean. The sampling units were the households from the sampled villages in the study area. Moreover, because common bean smallholder farmers were evenly distributed among the two selected divisions, 100 farmers from each division were sampled to make a targeted total sample size of 200 farmers. In Bashnet division, out of 11 wards, the sample was drawn from Bashnet, Nar, Dareda and Ayalagaya. Specifically, farmers forming the sample were residing in the villages of Long and Bashnet in Bashnet ward. Respectively, 30 and 10 households from Long and Bashnet villages were systematically selected from a farmers' sampling frame. Ten households were sampled from Gabadaw village, which is among the two villages in Nar ward. On the other hand, Seloto was selected among three villages in Dareda ward. From this village, 25 households were sampled. Hayesam village from Ayalagaya ward was similarly selected, where 25 households were sampled to complete a list of 100 households from Bashnet division.

On the other hand, from Babati division, Gallapo and Qashi wards were purposively selected. Gallapo and Endanoga villages were subsequently selected basing on the same approach. In this case 20 households from each village were sampled. Tsamas and Ng'wang'weli villages were purposively selected amongst six villages in Qashi ward where 40 and 20 households, respectively, were sampled from these two villages because there were more common bean farmers in Tsamas as compared to Ng'wang'weli. In addition 40 and 60 households were sampled from Gallapo and Qashi wards respectively giving another 100 households to complete a total sample size of 200 households.

Primary data such as social-economic status of households and institutional characteristics like farmer's age, gender, years of schooling, farming experience, main occupation, household size, the income profiles, distance to the market, extension contacts, group membership, credits, cropping and farming characteristics were collected from the sampled farmers using structured interview schedules method. In addition, secondary data such as district production estimates and costs including average input prices, yearly quantities of seeds produced along with the supply of fertilizers and agro-chemicals was obtained from published literature and key informants from Selian Agriculture Research Institute (SARI) and Babati District Council Agriculture Department. Published literature were also reviewed from Sokoine National Agricultural Library, Egerton University main library and the internet to get related information.

To achieve the objectives of the study, several statistical techniques and methodologies were employed during data analysis. These included Descriptive Statistics, Gross Margin analysis and empirical models. The descriptive statistics and analysis of Gross margin were done on MS Excel while the empirical models were run in SPSS (version 22) and STATA computer software.

Research application

The study interviewed 200 households. Among the interviewed farmers, 81.4% were male and 18.6% were female. Of the interviewed farmers, 52.5% were aged between 40 to 60 years. Based on the Tanzanian education system, 73% of respondents had primary school education. The average farming experience was found to be 18 years. On the other hand, the common bean farming experience of the household head was 17 years while common bean marketing experience was 14 years. The average land owned by the sampled farmers was 2.48 ha. The findings indicated that 43% of the land was allocated to cereals, 29% and 14% to beans and other legumes, respectively. Study results show that, the average daily working hours for men and women were 5 and 7, respectively. Land preparation, sowing and weeding activities were mostly done by women (54%). In addition, harvesting, threshing and transportation of threshed bean to home were done equally by male and female but storage and marketing activities were done by mostly men (53%) compared to women 16%. Of the respondents, 55% grew local bean varieties while 74% grew improved varieties. These were often intercropped with maize. Local and improved bean varieties were monocropped by 38% and 20% of smallholder bean farmers, respectively.

The average productivity of local and improved bean varieties was reported to be 594.45 kg/ha and 695.44 kg/ha, respectively (Table 1).

Table 1: Productivity of local and improved bean varieties in Babati District

Crop grown	Total area (ha)	Total yield (kg)	Productivity (kg/ha)
Local bean variety	123.45	73,385	594.45
Improved bean variety	21.20	14,740	695.44

Among the sampled farmers, 47% had off-farm income generating activities. The average distance to the nearest market was 2.88 km, 6.20 km to the most visited market and 10.51 km to the most preferred market. The transport cost was TZS 24/= /kg to the nearest and most visited markets but TZS 26/= /kg to the most preferred market. The most common modes of transport to the markets were vehicles (34%) and animal carts (31%). Other modes were head loading (16%), animals (10%) and motorbikes (8%). Twenty six percent of smallholder farmers sold their beans on-farm, 58% to the local market, 14% at to the main road, and 2% to the district market. In all the buying points, 23% of buyers were local assemblers, 25% wholesalers, 29% retailers, 12% urban collectors, and 11% direct consumers.

At farm-gate, improved bean varieties fetched an average price of TZS 1,023.68/= (US\$0.49) per kg while at the market the average price was TZS 1,208.33/= (US\$0.58). On the other hand, the local bean variety fetched an average price of TZS 770.87/= (US\$0.36) and 914.38/= (US\$0.44) per kg at farm-gate and market level, respectively.

Table 2: Prices for local and improved bean varieties in Babati District

Category	Farm gate (TZS/kg)	Farm gate (US\$/kg)	Market (TZS/kg)	Market (US\$/kg)
Improved variety average price	1,023.68	0.49	1,208.33	0.58
Local variety average Price	770.87	0.36	914.38	0.44
Difference (TZS/kg)	252.82	0.12	293.95	0.14

Of the interviewed farmers, 7% had access to credit. Of these, 60% obtained credit from VSLA, 20% from banks, 13% from SACCO, and 7% from other sources. Forty seven percent of the sampled farmers had access to extension services; 31% of them received advisory services during the outbreak of disease and or pests; 28% at harvesting; 24% got the service during sowing time. Farmers get information on improved bean varieties during field days/visits from other NGOs (48%), researchers (25%), SARI/CIAT (18%) and government (9%).

On average, farmers produced 358.70 kg and 72.095 kg per season of the local and improved varieties, respectively. The corresponding average farm-gate prices were TZS 962.18/= (US\$0.45) and TZS 1,161.67/= (US\$0.55) per kg for local and improved

varieties, respectively. The average total revenue from common bean per smallholder farmer at farm level was TZS 428,884.57/= (US\$204.23) / acre per season, with TZS 345,133.97/= (US\$164.34) from the local bean variety and TZS 83,750.60/= (US\$39.88) from improved bean varieties. The total costs incurred during production was TZS 117,401/= (US\$55.90) while the Gross Margin (net profit margin) was TZS 311,483.56/= (US\$148.33) per season.

Discussion

Common bean business attracted mostly male farmers and generated significant income. Men are generally attracted to agricultural activities which generate sizeable income. Often for a crop cultivated by women, the produce is consumed at home or sold to generate family income. Most farmers had only basic education and can therefore be considered literate. Education is important as it makes a farmer innovative and also allows them understand concepts that are taught in the trainings easily and consequently adopt new technologies with ease. Smallholder farmers in Babati district consider common bean as the second most important crop after cereals (mainly maize) when allocating land. They also preferred intercropping to other systems most likely because common bean, as other legumes fix soil nitrogen which improves soil fertility.

Smallholder farmers distribute risk through investing in off-farm activities to access income. This provides them a reliable insurance during hunger periods. Improved bean varieties fetched TZS 252.82/= (US\$0.12) and TZS 293.95/= (US\$0.14) per kg more at farm-gate and market level, respectively. This is likely because the improved bean varieties have customer desirable characteristics such as shorter cooking time, single seed colour, and pleasant taste. The stringent rules to obtaining and repaying credit determined the amount of credit to be invested in farming. Most of credit beneficiaries preferred investing in crops which they harvest in a short time. Common bean was therefore a preferred crop. The main constraints to accessing credit were mainly due to failure in meeting the criteria for loans such as evidence of reasonable assurance of having cash or in kind assets. The other obstacle to farmers for accessing credit was absence or poor business records with which their business history could be assessed.

Extension service delivery was a constraint to the majority of smallholder farmers in Babati district. This is due to the fact that farmers depend heavily on government extension officers who are very few and each has a large area to cover. Nevertheless smallholder farmers have a number of channels for receiving information. However, farmers are pessimistic about some sources of information conveyed to them especially on prices and seed quality from buyers and seed dealers. Information received by common bean farmers affects decisions made, and transaction costs. The role of collective action in mitigating the challenges facing farmers is still underutilized. For example group membership would significantly increase the output of bean producers. As at the time of the study producers got little profit from their produce because of exploitation by traders. The low profit margins earned by smallholder farmers could also be attributed to the relatively small quantities

of output. This is compounded by the fact that local bean varieties fetch relatively low prices compared to improved varieties. Further, there is poor access to market information especially demand and supply in urban areas. Poor access to market information implies that often smallholder farmers sell their produce at low farm gate prices.

The socio-economic factors that influenced the profit margin were farm-gate price, gender, access to market information, land size, off-farm income, education level and yield. Results in Table 3 show that a relationship existed between the gross margin and socio-economic factors. The coefficients of farm-gate price, land size, gender, market information and yield had positive signs, implying that these variables had a direct relationship with common bean gross margin. As more of these variables are engaged, there will be an increase in the amount of gross margin realized by smallholder farmers. On the other hand, the coefficients of education level, household size, farming experience and off-farm income had negative signs, implying an inverse relationship with the amount of gross margin. This agrees with a priori except education level. The a priori expectation of the sign of coefficient of education level was expected to be positive. The negative sign could be attributed to the fact that in some parts of the study area there were smallholder farmers with few years of formal education but were consistently producing high quantities of common bean. The reason might be, regardless that most of common bean farmers in Babati district had low education level, they may have had various trainings on bean production and or marketing. This could easily have substituted formal education. Illegal actions (use of re-calibrated weighing scales to cheat farmers and lying about the actual market prices) by middlemen, inadequate processing facilities, counterfeit seeds, low yielding varieties, poor markets, shortage of inputs, diseases and pests, shortages of extension services and dearth of market information were the main challenges facing smallholder bean farmers in the study area.

In the context of bean production, there is need for the Ministry of Agriculture, Livestock and Fisheries (MALFs) to take lead in interventions towards improving farmers' extension service and training. Farmers should be trained on correct pesticides use, and also

Table 3: Regression results of factors affecting common bean's gross margin

Variables	Unstandardized Coefficients B		Standardized Coefficients Beta	t	Sig.
Educational level	0.142	0.082	-0.129	1.735	0.085
Farm-gate price	0.134	0.023	0.450	5.928	0.001
Land size	8.340	0.473	6.254	-0.373	0.002
Gender	8.477F-02	0.021	0.306	4.085	0.001
Yield	679.010	46.800	0.902	14.509	0.000
Household size	-1.502F-02	0.21	-0.052	-0.724	0.470
Off farm income	-106263.719	32796.173	-0.164	-3.240	0.001
Market information	7.866E-02	4.377	14.653	3.347	0.001
Farming experience	-2253.242	1440.107	-0.116	-1.565	0.119

encouraged to grow improved varieties. Improved varieties were relatively more productive, and pest and disease resistant compared to local varieties. The National Beans Research Programmes are also encouraged to improve seed disseminating mechanisms. Most farmers have either not heard about new varieties or fail to differentiate between Quality Declared Seeds (QDS) and counterfeit seed.

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