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COMPETITIVENESS AND COMPARATIVE ADVANTAGE OF HARICOT BEAN AND ONION PRODUCTION: A STUDY IN DUGDA DISTRICT OF OROMIA NATIONAL REGIONAL STATE, ETHIOPIA

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ABSTRACT

The study was conducted with the main objectives of examining the profitability, comparative advantage and extent of government intervention on haricot bean and onion production in Dugda district of Ethiopia. The study used a cross-sectional data collected from a total of 122 sample rural households and ten traders. Moreover, secondary data were also collected. The Policy Analysis Matrix (PAM) methodology was employed in which basic policy indicators (the nominal and effective protection coefficients, private cost ratio and domestic resource cost ratio], using SPSS version 20.0, were derived. The results of the study revealed that the financial and economic profits for both products were positive indicating that both haricot bean and onion production in the study area were profitable for the producers in particular and for the country at large. The divergence between private and social values, which showed the net effect of policy distortion and market failure, was negative indicating that households of both products were implicitly taxed on their output while subsidized on the use of tradable inputs. On the other hand, households producing haricot bean and onion were implicitly subsidized and taxed on the use of domestic resources, respectively. The effective protection coefficient (EPC), taking into account both the output and tradable input markets together, revealed a net disincentive for both products as their EPCs were 0.8489 and 0.7426, respectively. The domestic resource cost (DRC)

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ratio values, which were 0.4066 and 0.4363, for haricot bean and onion production, respectively, confirmed the comparative advantage of producing both crops in the study area given the present inputs used and outputs produced with their associated prices, production technologies, existing policies and market failures. Furthermore, sensitivity analysis with various scenarios was carried out in order to assess the effect of different strategies on the production of haricot bean and onion. In this study, in order to sustain and improve the competitive and comparative advantage of both haricot bean and onion products, intensively continue with a participatory, consultative, innovative and proactive approach for awareness creation, trader's business skill development, provision of appropriate infrastructure, reduction in import tariff on imported agricultural inputs and the gradual foreign exchange liberalization as well as use of improved and efficient agricultural technologies have a paramount importance.

Key Words: **Competitive Advantage, Comparative Advantage, Policy Analysis Matrix, Domestic Resource Cost, Effective Protection Coefficient**

1. INTRODUCTION

1.1. Background of the Study

Agriculture has always been an important sector and plays a key role in the social and economic development of Ethiopia. To this end, about 80% of the population is directly or indirectly engaged in agriculture. The sector is also the main source of foreign currency for it accounts for about 75% of the total export and about 41% of the national gross domestic product (GDP) of the country (MoFED, 2013). Smallholder agriculture is the dominant sub-sector accounting for 95% of the total cultivated land and production (CSA, 2010; Techane, 2010). This occupational status, therefore, placed the smallholder farmers as a central focus of development policies and strategies (Kindie, 2007).

To this end, the government of Ethiopia designed an overarching development strategy known as ADLI (Derese, 2003; Bezabih *et al.*, 2010), which considers commercial agriculture as the engine of growth by building the competitiveness of the sector in the global market in general and the domestic market in particular (MoFA, 2007). Apparently, under the umbrella strategy of ADLI, the government of Ethiopia designed a various strategies (SDPRP, PASDEP, GTP) which

visualize export-led growth strategy for the agricultural sector to increase earnings by expanding and diversifying the items in which it can have a comparative advantage in the international market (MoFED, 2010). In connection to these, more than ever, economists now agree that the gains from trade are a key source of national wealth and faster growth can be achieved by pursuing activities with greater comparative advantages (Torres and Chavez, 2011) as comparative advantage analysis is a first approximation to generate information that will guide policy and decisions makers and allocate resources to their most productive uses (Monke and Pearson, 1989). To this end, the government promotes and encourages the export of coffee, pulses, oilseeds, herbs, fruits, vegetables and cut flowers in terms of volume and value.

Due to the fact that Ethiopia is predominantly an agrarian economy, the lion's share of the country's livelihood at large and the foreign exchange in particular comes from the agricultural sector. However, in recent years, the national economic performance corresponds to the fluctuation of income earned from coffee export has jeopardized. Hence, the competitiveness of the agricultural sector in general and potentially marketable crop production in particular is very crucial to reap the potential benefits and contribute their role in the endeavourer of the country's economic growth. To this end, production of pulses and horticultural products recently have gained attention with in the government policies and strategies in order to increase the farmers' income as well as the foreign exchange earnings of the country at large.

Among pulses, haricot beans are grown throughout Ethiopia, mainly in the Rift Valley area and are increasingly becoming important commodities in the farming system as a means of employment, source of cash, nutrition and its role in food security at a household level and as a source of foreign currency at large (Ferris and Kaganzi, 2008). The export volume of the product increased to 70350 tons in 2007 and to 78271 tons in 2008 generated export income of USD 32 million and USD 49.70 million, respectively (Abebe *et al.*, 2010). Moreover, due to the export led agricultural commercialization policy, its annual average production was increased by 24.5 percent from 2003 to 2008 and its percentage share from total pulses production accounted for 36 percent in 2008 (ibid).

1.2. Statement of the Problem

The question of whether increased integration to the global economy through trade liberalization could help Ethiopia to substantially reduce poverty and achieve economic growth takes an interesting dimension since the country has started negotiation as a part of its accession to WTO. Ethiopia, to be a member of WTO, should be committed to the rules and regulations that the Uruguay Round Applied to Agriculture. This demands a significant change in economic policies and trade regimes, which in turn will have significant implications for the national economy in general and in the production and exchange of agricultural commodities in particular (Wolde, 2006). However, whether or not a country can take advantage of new trading opportunities will depend on its comparative advantage without the subsidies or with the limited subsidies that are permitted for all trading partners by the rules governing the new trading environment (Bigsten *et al.,* 2009).

Through its Growth and Transformation Plan (GTP), the Government of Ethiopia promotes, encourages and supports the export of coffee, pulses, oilseeds, herbs, fruits, vegetables and cut flowers in terms of volume and value (MoFED, 2010). Among these favorite export products, onion and haricot bean are highly produced to a large extent and supplied to the export market in Dugda district of Ethiopia in recent times. In conventional economic terms, the development of new market circumstances leads the state to consider changing its intervention in the market through a reordering of existing instruments or the use of new instruments (subsidies, taxes, tariffs, exchange rate, technology, etc.) on factor and product markets in order to assist producers to take better advantage of opportunities (Mahlanza *et al.,* 2003). However, such policies influence the comparative advantage of commodity systems, particularly in agriculture (Pearson *et al.,* 2003), and neoclassical economic theory shows that this could lead to a misallocation of resources, even if a given commodity is financially viable.

Moreover, it is expected that the pace of world economic liberalization is increasing, given that the domestic agricultural production is dependent on tradable agricultural inputs such as pesticides, fertilizer, seed, etc., the price of inputs may change with possible import impediment reductions (Ehui *et al*., 2003; Akter *et al*., 2004). The price of output may also change with competition through cheaper import of processed and/or raw agricultural products (ibid). In

addition, the world economic reform will also certainly bring about change in the factor market (price) such as land and labor and change in the macroeconomic policies such as exchange rate and interest rate policies (Nguyen and Zenaida, 2006).

On the other hand, the social profitability of a commodity deviates from private profitability because of distortions in the factor and output markets, externalities and government policy intervention that tend to distort relative prices in most developing countries (Muhammad and Mustafa, 2011). Financial profitability, which guides farmers' production decisions, is based on calculations of prices farmers actually receive or pay. These prices may diverge from the societies opportunity cost of inputs and outputs because of many distortions in the product and factor markets such those arising from trade restrictions, government taxes or subsidies, monopoly elements in marketing, surplus labor conditions and segmentation in the capital market (Clark and Thompson, 2011).

It is, therefore, important to measure the comparative advantage of onion and haricot bean production to ascertain whether social welfare is being maximized. However, studies undertaken, in Ethiopia in general and the study area in particular, on the comparative advantage of haricot bean and onion production are insufficient. Therefore, analyzing the competitiveness and comparative advantage of haricot bean and onion production, in Dugda district, is necessary to determine their profitability and resource use efficiency as well as the degree of government intervention for the farming community.

2. METHODOLOGY

2.1. Description of the Study Area

This study was conducted in one of the central part of rift valley areas of Ethiopia, East Showa Zone of Oromia Regional State, Dugda district. It is located approximately between 7^0 $58^{'}$ latitude in the north and 38^0 $43^{'}$ longitudes in the east at an altitude of 1600 to 2300 m.a.s.l. Its annual rainfall is between 700mm to 800mm while the annual temperature is between 22^0C and 28^0C. The district's administrative seat, Meki is found 134 Km away from Addis Ababa to the Southeast and 88 Km west of Adama along the main asphalt road. The total surface area of the district is 1468 square kilometer of which 962.47 square kilometer belongs to the total area of

land available. The district, which is composed of 36 peasant associations and three urban kebeles, shares border line with Bora woreda in the North and Northwest, Arsi in the East, ATJK district in the South and Soddo woreda of SNNPR in the West. In addition, the district is fallen in the Lake Basin of rift valley floor dominated by quaternary sediments which is conducive for farming activities.

2.2. Sampling Techniques and Procedures

In order to select the sample household farmers and then to collect the required primary data, a two stage sampling technique was employed. First, based on the available data obtained from Dugda District Agricultural and Rural Development Office, among a total of 12 onion growing rural kebeles, three kebeles; Bekele Girisa, Giraba Korke Ady and Shumi Gemo, which are producers of both haricot bean and onion to a large extent, were selected purposively. During the selection process, the kebeles' actual capacity for onion and haricot bean production was taken into consideration.

The sample size for the study was determined based on the formula given by Yemane (1967). Based on this formula, it was assumed that 0.5 the maximum variability of the population; a desire level of 95%confidence and ±8% level of precision expected, a total 140 households were selected.

$$n = \frac{N}{1+N(e)2} = \frac{1340}{1+1340\,(0.08)2} = \frac{1340}{9.58} = 139.87 \approx 140$$

In the second stage, 50 farmers from Bekele Girisa, 52 farmers from Shumi Gemo and 38 farmers from Giraba Korke Ady were randomly selected using proportional probability to sample size (PPS). On the other hand, using random sampling four traders for each product were selected from Meki town in order to collect the data on transaction cost of both outputs. Moreover, two wholesalers which are also processors, in Adama town, were purposively selected in order to collect the data on transaction cost and processing cost of haricot bean product.

2.3. Sources and Methods of Data Collection

In order to meet the objectives of this study, both primary and secondary data were collected. The primary data were collected using pre-tested structured interview schedule or questionnaire from sample producers and traders. On the other hand, the secondary data on the socio-economic

information of the district, on transaction costs of importing farm inputs and exporting output, world price of inputs and outputs and other macroeconomic and policy variables such as exchange rate, interest rate, tax and subsidies as well as total values of import and exports of the country, which were required in the data analysis, were collected from published and unpublished documents of various local and federal institutions.

The institutions were Dugda Agriculture and Rural Development Office (DARDO), Dugda Finance and Economic Development Office, Meki-Batu Fruit and Vegetable Cooperative Union, Bora-Dembel Fertilizer Distributing Union, National Bank of Ethiopia (NBE), Ethiopian Revenue and Custom Authority (ERCA), Commercial Bank of Ethiopia (CBE), Agricultural Input Supply Enterprise (AISE), Ministry of Finance and Economic Development (MoFED), Ethiopian Petroleum Supply Enterprise (EPSE), Ministry of Agriculture (MoA), Ethiopian Maritime and Transit Enterprise (EMTE), Ethiopian Commodity Exchange (ECX), Ministry of Trade and Industry (MoTI) as well as different traders and exporters.

2.4. Method of Data Analysis

To achieve the research objectives of this particular study, the Policy Analysis Matrix (PAM) approach was employed. PAM has proven to be one of the most suitable research tools in examining the competitiveness, efficiency and degree of government intervention on a given commodity production within the economy's agricultural system (Nguyen and Zenaida, 2006; Ho and Nguyen, 2011; Ogbe *et al*., 2011). In addition, its simplicity and understandable nature, particularly to policy makers in computing essential indicators, its suitability for disaggregation of production activities and their costs (Mohanty *et al*., 2003) as it makes the analysis of policy induced transfers straightforward (Rehman *et al*., 2011).

2.4.1. Formulation of a policy analysis matrix (PAM)

In order to build up the PAM framework, four steps, which are adapted from Harrigan *et al*. (1992) and Nguyen and Heidhues (2004), had been followed and presented as follows:

Step 1. Inventory budget table

An Inventory Budget Table was established for the representative commodity system, which consists of an inventory of the physical inputs and outputs for each activity along with their private and social (efficiency) prices. At producer level, this will take the form of the familiar farm budget. According to Pearson *et al.* (2003), the data in the budgets should be measures of average cost and returns not that of the best and most progressive farmers.

Step 2. Input disaggregation table

An Input Disaggregation Table categorizes all the commodities and services, which are inputs to the system, into tradable inputs, domestic factors, transfers and non-tradable inputs, which themselves have to be disaggregated and so that ultimately all component costs are classified as tradable input, domestic factors, or transfers.

Step 3. System budget table

A System Budget Table, which takes the price and quantity data contained in the inventory budget table in which inputs to the system as they appear in the Input Disaggregation Table, was constructed from the Inventory Budget Table combined with the Input Disaggregation Table (Nguyen and Heidhues, 2004). Thus, the system budget contains all output and input components valued with their corresponding private and social prices in which inputs are subdivided into tradable and non-tradable, which includes all domestic factors.

Step 4. Policy analysis matrix (PAM)

Finally, the Policy Analysis Matrix (PAM) was constructed by adding together all the respective private and social revenue and cost data from the relevant headings in the System Budget Table.

2.4.2. Structural framework of a policy analysis matrix (PAM)

Table 1. Structure of the policy analysis matrix (PAM) framework

Description	Revenue	Costs		Profit
		Tradable inputs	Domestic factors	
Private price	A	B	C	D[a]

Social (shadow) price	E	F	G	H[b]
Effect of divergence	I[c]	J[d]	K[e]	L[f]

Source: Monke and Pearson (1989)

[a] Private profit (D) = A - (B + C)

[b] Social profit (H) = E - (F + G)

[c] Output transfer (I) = A - E

[d] Tradable input transfer (J) = B - F

[e] Domestic factor transfer (K) = C - G

[f] Net transfer (L) = D - H = I - (J+ K)

According to Nguyen and Heidhues (2004), the overall detailed formulas for the main components of the policy analysis matrix (PAM) are:

$$A = \sum_{c=1}^{k} P_c T_C \qquad E = \sum_{c=1}^{k} P_c(s) T_c$$

$$B = \sum_{i=1}^{n} P_i Q_i \qquad F = \sum_{i=1}^{n} P_i(s) Q_i$$

$$C = \sum_{j=1}^{m} W_j L_j \qquad G = \sum_{j=1}^{m} W_j(s) L_j$$

Where:

P_c and $P_c(s)$: are prices of product ‘c’ measured in private and social prices, respectively,

P_i and $P_i(s)$: are prices of tradable input ‘i’ measured in private and social prices, respectively,

W_j and $W_j(s)$: are prices of domestic factors "j" measured in private and social prices, respectively,

T_c: is quantity of product ‘c’ produced per unit of observation (for example, per hectare),

Q_i, L_j: are quantity of tradable input ‘i’ and domestic factor ‘j’ used in production, and

k, n, m: are number of outputs, tradable and domestic inputs used in the system, respectively.

3. RESULTS AND DISCUSSION

3.1. Inventory and System Budget for Haricot Bean and Onion Production

Table 2. Inventory budget table of haricot bean and onion production in Dugda district

Description	Haricot bean	Onion
Yield (kg/ha)		
Main product	1260.00	25680.00
Straw	388.50	-
Onion type not fit for export (sold for local market)	-	650.00
Material inputs		
Seed (kg/ha)	100.00	12.00
Fertilizer (kg/ha)		
DAP	25.00	250.00
Urea	25.00	300.00
Pesticides		
Redomill (kg/ha)	0.00	5.00
Selecron (liter/ha)	0.00	7.00
Mancozeb (kg/ha)	0.00	8.00
Endosulfen (liter/ha)	0.00	4.00
Petroleum (liter/ha)		
Benzene	0.00	100.00
Gasoline	0.00	100.00
Manure (kg/ha)	0.00	500.00
Sacks (ETB/ha)	23.10	0.00
Storage (ETB/ha)	11.50	0.00
Farm tools' depreciation (ETB/ha)	33.29	841.47
Repair and maintenance (ETB/ha)	0.00	992.31
Draft animal (hr/ha)	121.46	93.21
Capital (credit) (ETB/ha)	1727.50	19399.11

Labour (hr/ha)	325.13	3010.65
Irrigation and spraying (package)	0.00	1.00
Others (package)	0.00	1.00
Land (ha)	1.00	1.00

Source: Computed results from survey data

Table 3. System budget table of haricot bean production (ETB/ha) in Dugda district

	Description	Private price	Shadow price
1	**Revenue**		
	Main product	9009.00	10747.80
	Straw	971.25	971.25
	Total revenue	9980.25	11719.05
2	**Tradable Costs**		
	Seed	0.00	0.00
	Fertilizer	580.20	645.43
	Pesticides	0.00	0.00
	Petroleum	0.00	0.00
	Total tradable cost	580.20	645.43
3	**Domestic Costs**		
	Seed	700.00	630.00
	Fertilizer	80.32	80.45
	Pesticides	0.00	0.00
	Petroleum	0.00	0.00
	Manure	0.00	0.00
	Sacks	23.10	23.10
	Storage	11.50	11.50
	Farm tools' depreciation	33.29	33.29
	Repair and maintenance	0.00	0.00

Draft animals	1214.60	1214.60
Interest	89.45	87.15
Labour	1219.24	823.00
Irrigation and spraying (package)	0.00	0.00
Others (package)	0.00	0.00
Land	60.00	1600.00
Total domestic cost	**3431.50**	**4503.09**

Source: Computed results from survey data

The data obtained from both system budget tables, which group all tradable input cost components in one and all the non-tradable input cost components in another in terms of both private and shadow price valuation, were used in formulating the PAM framework. The system budget tables constructed for both haricot bean and onion production in the study area, Dugda district, are presented in Tables 3 and 4, respectively.

Table 4. System budget table of onion production (ETB/ha) in Dugda district

	Description	Private price	Shadow price
1	**Revenue**		
	Main product	70620.00	92191.20
	Onion type not fit for export (sold locally)	975.00	975.00
	Total revenue	71595.00	93166.20
2	**Tradable Costs**		
	Seed	0.00	0.00
	Fertilizer	6319.00	7028.66
	Pesticides	5396.65	6114.32
	Petroleum	2583.00	2865.00
	Total tradable cost	14298.65	16007.98
3	**Domestic Costs**		
	Seed	5040.00	4536.00
	Fertilizer	879.68	881.16

Pesticides	1742.63	1741.68
Petroleum	236.00	235.00
Manure	7500.00	7500.00
Sacks	0.00	0.00
Storage	0.00	0.00
Farm tools' depreciation	841.47	841.47
Repair and maintenance	992.31	992.31
Draft animals	1165.13	1165.13
Interest	1004.50	978.67
Labour	11289.94	7620.72
Irrigation and spraying (package)	4400.00	1452.00
Others (package)	920.00	920.00
Land	60.00	4800.00
Total domestic cost	**36071.66**	**33664.14**

Source: Computed results from survey data

3.2. Profitability of Haricot Bean and Onion Production

With reference to Tables 5 and 6, given the current agricultural and macroeconomic conditions and policies, both the private and social profits of haricot bean and onion production were significantly positive. This indicates that productions of both crops are profitable for the sample households in particular and for Dugda district at large. The degree of social profits were about 10% and 51% larger than their private analogue, for both crops, respectively; implying that the net effect of distorting policies made the market prices paid to sample households were less than their opportunity cost. This implies that the sample households utilize scarce resources efficiently in the production of both commodities and that the households can survive without government interventions at the margin.

Table 5. Policy analysis matrix (PAM) for haricot bean production (ETB/ha) in Dugda

Costs

	Revenue	Tradable inputs	Domestic factors	Profit
Private price	9980.25	580.20	3431.50	5968.55
Shadow price	11719.05	645.43	4503.09	6570.53
Divergence	-1738.80	-65.23	-1071.59	-601.98

Source: Computed results from survey data

Table 6. Policy analysis matrix (PAM) for onion production (ETB/ha) in Dugda district

	Revenue	Costs		Profit
		Tradable inputs	Domestic factors	
Private price	71595.00	14298.65	36071.66	21224.69
Shadow price	93166.20	16007.98	33664.14	43494.08
Divergence	-21571.20	-1709.33	2407.52	-22269.39

Source: Computed results from survey data

The profit transfer divergences -601.98 and -22269.39 ETB/ha for haricot bean and onion production, respectively, as presented in Tables 5 and 6, implying that in the absence of government intervention, producers of both crops could earn higher profits. In other words, from the producers' point of view the profit per hectare from these products should be increased by that amount, respectively. Moreover, the PAM result revealed that, although both crops are financially and economically profitable, onion is more profitable in both private and social prices than haricot bean production.

On the other hand, the output transfers -1738.80 and -21571.20 ETB/ha for haricot bean and onion, respectively, indicate that the effect of distorting policies and market imperfection forced sample households to receive less prices than the border parity prices for their products. That means the government imposed an implicit tax on both outputs. This suggests that the existence of overvalued exchange rates in the period amounted to an output tax on sample households. In other words, the amounts also represent saving to the society and can be interpreted as transfers from haricot bean and onion producing households to the society.

Furthermore, the tradable inputs' transfers -65.23 ETB/ha for haricot bean and -1709.33 ETB/ha for onion production showed that the sample households implicitly subsidized on the use of tradable inputs. This is reflected in the excess of true economic cost over the actual amount paid due to existence of overvalued exchange rates and low interest rate. The results also indicate that the amount of implicit subsidy by and large goes to onion production than haricot bean production. This was mainly due to the fact that onion production utilizes more amounts of imported fertilizers, petroleum and pesticides than haricot bean production.

The non-tradable input transfers are negative for haricot bean, mainly due to high land rental value, and positive for onion production, mainly due to low social cost of labor, seed and interest than the private analogue; implying that the opportunity cost of using domestic resources was about 31% higher than the private values for haricot bean and 7% lower for onion production. In other words, haricot bean producing sample households were implicitly subsidized while onion producing sample households were implicitly taxed on the use of domestic resources.

3.3. Policy Indicators Derived from PAM of Haricot Bean and Onion Production

Table 7. PAM indicators of haricot bean and onion production in Dugda district

	NPCO	NPCI	EPC	PC	PCR	DRC
Haricot bean	0.8516	0.8989	0.8489	0.9084	0.3651	0.4066
Onion	0.7685	0.8932	0.7426	0.4880	0.6296	0.4363

Source: Derived from PAM's simulation results

3.3.1. Nominal protection coefficients

The nominal protection coefficient (NPCO) values of both haricot bean and onion, as presented in Table 7, were below one. This indicates that the net effect of government intervention and market distortion not corrected through efficient policies found to reduce market prices or private revenue, making them lower than world prices or social revenue. In other words, the reduction in revenue made sample households to be implicitly taxed by about 14.84 and 23.15 percent on haricot bean and onion production, respectively.

Moreover, the nominal protection coefficients on tradable inputs (NPCI) values for both crops were also below one; implying that imported agricultural inputs (such as fertilizers, petroleum and pesticides) used in the production process are subsidized by the government. In other words, sample households received an equivalent effect of a price support of about 10.11 percent for haricot bean and 10.68 percent for onion production on the use of tradable inputs. In other words, in the production process of these crops, the cost of tradable inputs were only about 89.89 and 89.32 percent of what would have been at world prices for haricot bean and onion production, respectively.

3.3.2. Effective protection coefficients

As presented in Table 7, the effective protection coefficient (EPC) values, which reflect the net pattern of policy transfers in the tradable commodities markets, were less than one for both production activities. This indicates that the overall impact of the existing government policies influencing both the product and tradable input markets, in Dugda district, resulted in a net disincentive or an equivalent tax of about 15.11 and 25.74 percent for haricot bean and onion producing sample households, respectively. As a result, sample households producing the two crops implicitly taxed more on their output than subsidized on the use of tradable inputs.

Moreover, the profitability coefficient (PC) values, which measure policy incentives as an estimation of net policy transfer, were also below one for both production activities; implying that the financial gain concessions of haricot bean and onion production were 0.9084 and 0.4880 times that of their economic profit, respectively. In other words, the overall impact of the existing government policies influencing all the output, tradable and non-tradable input markets resulted in a net disincentive or an equivalent tax of about 9.16% for haricot bean production and about 51.20% for onion production. Based on these results, the overall net impact of the existing government policies on the output, tradable inputs and non-tradable inputs together, in the study area, imposed more implicit tax on onion producing sample households than haricot bean producing sample households.

3.3.3. Measure of competitive advantage

As indicated in Table 7, the private cost ratio (PCR) values for haricot bean and onion production were 0.3651 and 0.6296, respectively; implying that production of both crops, in the study area, could afford to pay their domestic factors and still remain competitive. In both cases, the market (private) net values added are greater than the private cost of their domestic production factors. Moreover, as a relatively low PCR value reveals a relatively high competitive advantage, haricot bean had more competitive advantage than onion production, given the current production technology, input and output prices and policy interventions. This indicates that the existing trade practice in the study area is competitive and profitable for households as well as participants involving in the chain.

3.3.4. Measure of comparative advantage

In order to examine the desirability of producing haricot bean and onion under consideration relative to the international market in terms of economic efficiency, the domestic resource cost (DRC) coefficient was derived. To this end, the DRC coefficients of both haricot bean and onion production, in the study area, were less than one; implying that production of both crops are competitive and the country has a comparative advantage for producing them in the study area. It is, therefore, socially desirable to produce and expand both haricot bean and onion production, which had DRC ratios of 0.4066 and 0.4363, respectively, in the study area. In other words, to earn or save one ETB foreign exchange from the international market, the sample households had to spend 0.4066 and 0.4363 ETB social costs of domestic resources for the production of haricot bean and onion, respectively.

In both cases, the social net values added are greater than the social cost of their domestic production factors, *i.e.*, the national cost of transforming domestic resources to yield a unit of foreign exchange was smaller than the value added at world prices; implying that the production of both crops, in the study area, represent an efficient use of scarce domestic resources. Furthermore, as a relatively low DRC value reveals a relatively high comparative advantage, haricot bean production had been more socially competent than onion production, given the current production technology, input and output prices and policy interventions.

3.4. Sensitivity Analysis of PAM Indicators of Haricot Bean and Onion Production

Since the data for the PAM for haricot bean and onion production represent a chosen base year, the results are static and potentially applicable to only that year. Projections of changing key input parameters should be made to simulate paths of dynamic comparative advantage, as the competitive and comparative advantage in response to varying key input parameters in the future. To this end, since world prices, import prices of (fertilizer, pesticides and petroleum), domestic factors of production (labor, capital and land) and production technologies (yield) are key input parameters of haricot bean and onion production, they may alter the competitive and comparative advantage of both production activities.

According to Ayalneh (2002), an entire sensitivity analysis, which evaluate the change in PAM indicators in reaction to the change in a range of parameters such as change in exchange rate, domestic and international prices of outputs and tradable inputs, yield, transportation, *etc*., at the same time, give more indicative results of profitability, competitiveness and policy alternative analysis. However, it is difficult to handle and usually avoided in most applied economic analysis (ibid). Hence, it is important to limit the sensitivity analysis to those input parameters that could have a potential impact. Following Ayalneh (2002), Shahabuddin and Dorosh (2002), Mohanty *et al.* (2003) in this analysis, a partial sensitivity analysis approach was employed. In a partial sensitivity analysis, changes in the PAM indicators are estimated while varying a single input parameter leaving the other input parameters at their base values.

To this end, based on the performance of Growth and Transformation plan of the country, on this particular study, the sensitivity of PAM indicators for the change in shadow exchange rate, world price of haricot bean and onion, import price of (fertilizers, pesticides and petroleum), production cost of domestic inputs and output yield, with four simulations i.e. $\pm$5% and $\pm$15%, are thoroughly examined.

Accordingly, the sensitivity analysis of the study showed that the comparative advantage of producing both products, in the study area, is very sensitive to changes in selected individual input parameters. For instance, with a 15 percent increase in the shadow exchange rate (SER), F.O.B price and yield, the comparative advantage of haricot bean production improved by about

15.30, 16.23 and 14.07 percent, respectively. At the same time, these changes resulted in about a 20.93, 22.92 and 15.31 percent improvement in the comparative advantage of onion production, respectively. In other words, while the cost of domestic resources unchanged, the rise in SER, F.O.B price and yield resulted in an increase in the social value added, causing an improvement in the comparative advantage of producing both products in the study area.

On the other hand, the sensitivity analysis of the study revealed that the comparative advantage of producing both crops, in the study area, slightly deteriorated as the C.I.F prices of fertilizer, pesticides and petroleum increased. To this end, for a 15 percent rise in the C.I.F price of fertilizers, the comparative advantage of haricot bean and onion production slightly deteriorated by about 1.34 percent. Moreover, with a 15 percent rise in the C.I.F price pesticides and petroleum, the comparative advantage of onion production slightly deteriorated by about 1.14 and 0.89 percent, respectively. These results implying that the comparative advantage of haricot bean and onion production, in the study area, seems to be insensitive to the change in C.I.F price of fertilizer, pesticides and petroleum. However, the comparative advantage of haricot bean and onion production, in the study area, was very sensitive to the change in production cost of domestic resources. To this end, with a 15 percent increase in the production cost of domestic resources, the comparative advantage of haricot bean and onion production deteriorated by about 14.99 and 15.01 percent, respectively.

Thus, the general conclusion from this study is that domestic agricultural and macroeconomic policy reforms as well as trade liberalization that alter the current production and trade environment seems to have a greater impact on the comparative advantage of both haricot bean and onion production in Dugda district in particular and in Ethiopia at large. This gives increased evidence that liberalizing policies will increase haricot bean and onion production in the district.

4. POLICY IMPLICATIONS

Based on the findings of this study, the following points need to be considered as possible policy implications in order to maintain and further improve the profitability and comparative advantage of both haricot bean and onion production as well as for the sustainable and efficient use of domestic resources.

1) The study revealed that production of both haricot bean and onion are profitable and competitive for households of Dugda district in particular as well as for the country at large, implying that households in the study area should be encouraged in their production of both crops. To this end, it is imperative to intensively continue with a participatory, consultative, innovative and proactive approach for awareness creation, trader's business skill development, provision of appropriate infrastructure and acknowledge the abilities and capacities of all stakeholders to make a valuable contribution to enhance the sustainable use of domestic resources efficiently.

2) The divergence between private and social profits, which have been caused by the net policy effects and market failures, should be minimized by taking measures that correct the inefficiency influence of market factors such as marketing infrastructure and institutional underdevelopments and environmental impacts of soil degradation. In addition, in line with trade liberalization measures, the reduction in import tariff on imported agricultural inputs and the gradual foreign exchange liberalization should also be facilitated so as to gain the comparative advantage of both products.

3) As the change in the yield of output brings a significant effect on the profitability and comparative advantage of haricot bean and onion production, improved and efficient agricultural technologies to increase productivity, with the support of research, should be guaranteed. To this end, the district's agricultural office should play a significant role in raising yields by disseminating best farm management practices; improved varieties, recommended fertilizer rates, improved agronomic and weed control as well as improved harvesting and post-harvest handling practices from progressive households as widely as possible through its extension agents particularly for those households whose productivity is far below the standard recommended by research institutes in the study area.

4) As indicated in the sensitivity analysis of this study, the export price has a strong positive effect on the profitability and comparative advantage of both haricot bean and onion production. Thus, creating a more conducive environment for all parties in the chain linking producers to exporters would enhance the position of Dugda district's households in the market. To this end,

information about the world market price including both the demand and supply side should be considered so as to reduce the possible revenue loss for the households as well as for the district in general.

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