



Economic production of cucumber crop in green houses with emphasis on its competitiveness for export

Sahar Mohamed Najeeb, Abda Abd Allah Emam

Sudan University of Science and Technology

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ABSTRACT

The study aimed at highlighting the economics of cucumber production with emphasis on its competitive advantage in Khartoum State, Sudan in 2013. The study used secondary data collected from different sources related to the area of the study. The data was analyzed using financial analysis and Policy Analysis Matrix (PAM).

The study concluded that the production costs and revenues and profits for cucumber export is high compared with the stages of production and domestic marketing, this proves the efficiency and profitability of the crop for export. The study also revealed the cucumber crops was economically profitable and competitive for export and local resources were used efficiently, the crop suffered from the burden of the tax. The study recommended reducing production costs and taxes to increase the competitiveness and encourage its production.

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INTRODUCTION

Agricultural sector in Sudan is considered as the leading sector in economic activities, it has the biggest contribution in national income. More than 70% of Sudanese works in this sector. It is considered as the main source of their diet. Also, it has a big share in exports such as cotton, sesame, gum Arabic, vegetable oils and livestock.

Vegetables in Sudan depend on traditional farming during the agricultural seasons

(summer, winter) and because of rapid growth of population and increasing knowledge on food habits, vegetables cultivated areas increased and because of environmental conditions farmers adapted themselves to use crops of high quality (Ahmed and Hassan, 1999).

To face the problems of shortage of vegetables during offseason, green houses appeared which represent vertical production of some vegetables and horticultural crops under suitable conditions.

Green houses system aims to maintain traditional harvesting time in open fields for the availability of large quantities of specific products which have a high demand locally or abroad.

Vegetables areas in Sudan were estimated to be 525000 feddan, representing 3% of total cultivated area. Cucumber cultivated area was 5000 feddan, representing 1% of vegetable total area (Areej, 2010). So cucumber is considered one of the important vegetables which can be produced in green houses and because it's limited cultivation period in open farm and its increasing demand in local consumption and export (Abd Elrahman, 2007).

The number of green houses in Khartoum State is 1005 house 531, 260, 170 and 44 of which are cultivated with cucumber, tomatoes, pepper, roses and straw berry, respectively. Production of cucumber in green houses has high yield, total production will be estimated to be 8762 Ton/ year (Ministry of Agriculture and Irrigation and Livestock, 2013).

This study investigated the economics production of cucumber with its competitiveness.

The comparative advantage differs from the competitive advantage in the fact that the comparative advantage depends on the differences and variations in the cost of production of a commodity from country to another i. e. it depends on the availability of production inputs, experience and the level of the technology used in producing the commodity while in the competitive advantage depends on the human factor role achievement through developing new techniques and continuously searching for new managerial ways to raise the output of the product and at the same managing ways to minimize the cost of production and so

forth. Also, means the production of local environment for specific region interact with different factors (economical, technical, educational, cultural and historical) to create the competitive advantage (Hassan, 2002).

Research methodology:

Methods of data collection:

Data was collected from different sources that are relevant to the study including the Central Bank of Sudan, Ministry of Agriculture, in addition to previous studies.

Methods of analysis:

1- Financial analysis:

) :PPC(Coefficient a/ Private Profitability Private Profitability Coefficient indicator is used to study the efficiency and profitability of a ton of cucumber at three levels of marketing (farm gate, local market and export).

$$PPC = \frac{TR}{TC}$$

Where:

PPC = Private Profitability Coefficient

TR = Total Revenue

TC = Total Costs

If PPC is less than one, this indicates that the project is not profitable if PPC is greater than one, this means that the project is profitable..

b/ Net Profit:

Net profit = Total revenue – Total costs

c/ Marginal product

Marginal product = Total revenue – Variable costs

d/ Proceeds per unit of quality:

e/ Revenue for every SDG invested:

$$= \frac{\text{Marginal profit}}{\text{Total variable costs}}$$

Depreciation calculations: f/

$$\frac{\text{Cost}}{\text{No. of years} \times \text{Production per year}} \text{ Depreciation in year} =$$

$$\text{Annual depreciation} = \frac{\text{Depreciation per year}}{\text{No. of seasons in year}}$$

$$\text{Depreciation per ton} = \frac{\text{Depreciation per year}}{\text{No. of tons per year}}$$

2- Policy Analysis Matrix method (PAM):

The PAM is a product of two accounting identities; one defining profitability and the difference between revenues and cost and PAM is based on the following simple equation:

$$\text{Profits} = \text{Revenues} - \text{Costs}$$

The other identity measures the effects of divergences (distortion policies and market failures) as the difference between observed

parameters and the parameters that would exist if the divergence were removed.

In PAM, cost was broken down into tradable and non-tradable inputs. Non-tradable inputs are called domestic resources or factors. Profit, revenue and costs were then calculated using both the actual prices (private prices since they are the prices usually faced by the private agents) and efficiency prices (social prices that would exist if all the markets are perfectly competitive and the economy is in a state of general equilibrium). The differences between the private and social prices are referred to as transfers.

The size of divergences reflects the extent to which actual distorted prices diverge from the efficiency prices. Table (1) illustrates the general matrix structure.

Table (1): The general structure of PAM

| Prices | Costs | | | Profit |
|----------------|---------|----------------|---------------------|--------|
| | Revenue | Tradable input | Non-tradable Factor | |
| Private prices | A | B | C | D |
| Social Prices | E | F | G | H |
| Divergences | I | J | K | L |

Source: Pearson and Monke 1987.

From Table (1), PAM can be calculated as follows:

Absolute international competitiveness indicators:

- Financial Profitability (FP)
 $D = A - B - C$
- Economical Profitability (EP)
 $H = E - F - G$
- International Value Added (IVA)
 $IVA = E - F$

Relative competitiveness indicators:

- Domestic Resource Cost (DRC)
 $DRC = G / (E - F)$

- Coefficient of International Competitiveness (CIC)

$$CIC = G / (IVA)$$

- Coefficients of Foreign Exchange = $B / (B + C)$

a) Nominal Protection Coefficient (NPC) $NPC = A / E$

b) Effective protection coefficient (EPC) $EPC = (A - B) / (E - F)$

Profits are defined as the difference between total (or per unit) sale revenues and

costs of production. This definition generates the first identity of accounting matrix.

Private profitability:

It is defined in the PAM as:

$$D = A - B - C$$

Social profitability:

It is defined at the PAM as: $H = E - F - G$

The measurement of the social prices in the PAM:

The differentiation between the private prices and the social prices reflect clearly the usefulness of the PAM, in which we shall measure it using the shadow prices based on price in the international markets. For tradable outputs and inputs which have no border prices we shall have to identify equivalent goods for factors which border prices do exist.

Absolute international competitiveness indicators:

1- Financial profitability:

It is the output of production. It reflects the producer prices which include taxes, subsidies of inputs. It shows clearly the actual profits in the agricultural system and the technology used in it, output values, input costs and the government interference. It is from the producer (farmer) view equal term gate price minus cost inputs. For the government view subtraction of cost of production and marketing from international prices in case calculated in local market prices.

$D = A - B - C$ from Table (1). The private or actual market prices thus incorporate the underline economic costs and valuation plus the effects of all policies and market failures. The private profitability calculations show the competitiveness of the agricultural system, given the current technology output values, input costs and

policy transfer. If the financial profitability is a positive value there is a profit.

2- Economic profitability:

$H = E - F - G$ Table (1) for the output (E) and the input (F) are traded internationally, the appropriate social valuations are given by the world prices at their (CIF) import prices for goods and services that are imported, or (FOB) export prices for exportable.

Cost Insurance Freight (CIF) is a term used to describe pricing or valuation of imported goods to include all of the transfer costs, of delivering the goods to the point of consumption.

Free On board (FOB) is a method where the transfer costs are excluded. It refers to export.

Financial analysis equations:

Financial and economic analysis:

Market conditions which diverge are called distorted or imperfect market. The market distortion is generally divided into two types:

- a) Endogenous distortion which are existed within the market structure.
- b) Exogenous distortion which are not inherited to the market structure.

The divergence due to the market structure stems from the number and size of distribution of sellers and buyers, the degree of the product differentiation and the ease of entry of new firms into the industry.

Regarding the valuation procedure, the private profitability is calculated by market prices and actual remuneration of the factors of production while for the estimation of economic profitability market prices are replaced by shadow prices. For imports (exports) the accounting prices are estimated directly by CIF (FOB) value converted into local currency and adjusted into international cost items. The international cost items are added to CIF value in case of

imports and import substitutes and deducted from the FOB value in case of exports.

The shadow prices are done via the following steps:

The data on costs and revenue items at market prices are divided into sub- items and each sub- item is decomposed into foreign and domestic components. This has been done by estimating the foreign exchange component (FOREX) of each item used in the analysis (Table 2).

1. CIF: "Cost Insurance and Freight" a term used to describe pricing or valuation of an imported goods to include all the transfer costs of delivering the goods to the point of consumption.
2. FOB "Free On Board" a method where the transfer costs are excluded. It refers to exports.
3. FOREX component refer to the percentage of the total price that must be directly or indirectly paid by using a foreign currency.

Relative international competitiveness indicators:

b) Domestic Resource Cost (DRC):

It is a measure and an indicator for efficiency of local resource usage and can be computed as follows:

$$DRC = \frac{G}{(E-F)}$$

Where:

G = domestic factor cost

(E-F) = IVA

It is practically a very important indicator. It is used to measure the economic efficiency at each stage of the commodity.

If DRC is less than one this means that the product used resources with efficiency according to the international prices and if DRC is greater than one then the opportunity cost of using domestic resources exceed the value added which means don not use the resources with optimum efficiency and if the indicator value equal to one that means the resources are enough to gain the product.

Relative protection:

a) Nominal Protection Coefficient (NPC):

It reflects the impact of policies on both output prices and inputs prices and distortion. It shows the diversity in local prices compared to international prices due to act of explicit and implicit taxes on the product or the subsidy for the crop. It can be calculated as follows:

$$NPC = \frac{A}{E}$$

It can be defined as the ratio of the revenues from the product at market price to its values in international prices (at social prices).

If the ratio is less than one this means that the resources used in the system is gaining less than earns if the commodity is freely traded i. e. the product is suffering from government taxes. If the ratio is greater than one this means that the product is subsidized by the government. If the ratio equals to one this means that price that used by the producer is equal to the international price.

RESULTS and DISCUSSION

Financial analysis:

The financial analysis was used to measure the levels of profits for the cucumber yield (SDG/T) for production, local marketing and export by comparing costs, revenues and profits using different standards (Fous *et al.*, 1993) (Table1).

Table 1: Financial Analysis results for cucumber (SDG/Ton)

| Items | Production | Local marketing | Export |
|------------|------------|-----------------|-----------|
| Price/ SDG | 3,250.00 | 6,000.00 | 13,200.00 |
| Revenue | | | 13,200.00 |

| | | | |
|--|--------------|--------------|--------------|
| | 3,250.00 | 6,000.00 | |
| Total Fixed Costs* | | *28.34 | - |
| Total Variable Costs | 2,122.50 | 1,100.00 | 2,300.00 |
| Total Costs | 2,150.84 | 1,100.00 | 2,300.00 |
| Net Revenue | 1,099.16 | 4,900.00 | 10,900.00 |
| Marginal product | 1,127.50 | 4,900.00 | 10,900.00 |
| Coefficient of Private profitability)CPP(Revenue/ each SDG invested | 1.51 0.53 | 5.45 4.45 | 5.74 4.74 |

Source: Compiled from data collected, 2013.

1/ Production costs (SDG/Ton):

Exports had higher production costs 2300.00 SDG compared to marketing and production costs 1100.00 and 2122.00 SDG/Ton, respectively.

2/ Net revenue (SDG/Ton):

Net revenue for export was 10,900.00 SDG/Ton higher than net revenue of local marketing and production 4900.00 and 109916 SDG/Ton, respectively this indicates the export profitability.

3/ Private Profitability Coefficient (PPC):

PPC for cucumber export was 5.74 while PPC for local marketing and production were 5.45 and 1.51, respectively this result indicates the efficiency and profitability of cucumber exports.

4/ Revenue per SDG invested:

Table (1) shows that one Sudanese pound invested in exports will gain 4.74 SDG while high gain of local marketing and

production were 4.45 and 0.53, respectively which indicates high gain from export.

Policy Analysis Matrix (PAM):

PAM was used to estimate the economic profitability and domestic resources cost and to measure the effect of policies on export so as to measure the competitiveness (Bushra, 2004 and Elhabob, 1994).

PAM for cucumber Export level (SDG/Ton):

Financial cost of cucumber was 8100 SDG/Ton where the share of tradable inputs was 798 SDG/Ton which was approximately 90% of the total cost

Economic costs in the same year were 8046 SDG/T. Share of tradable inputs and domestic factors were 11% and 89% of total cost, respectively. This result indicates that costs of domestic factors were higher than tradable inputs.

Table 2: PAM for cucumber Export level (SDG/Ton)

| Prices | Revenue | Costs | | Profit |
|-----------------|---------|-----------------|---------------------|--------|
| | | Tradable inputs | Non tradable factor | |
| Financial Price | 13200 | 798 | 7302 | 5100 |
| Economic Price | 15335 | 906 | 7140 | 7289 |
| Divergence | -2135 | -108 | 162 | -2189 |

Source: computed from data collected and analyzed, 2013.

Table (2) shows that economic profits 7289 SDG/Ton exceeding the financial profits 5100 SDG/Ton according to the export price 13200 SDG/Ton. The economic profit was higher than financial profit by 2189 SDG/Ton which indicated there were market distortions.

Economic profitability indicators:

From Table (3), the following results are drawn:

1/ Economic profitability (EP)

EP was positive which means that cucumber was economically profitable and the country has competitiveness in producing it (Person and Monke, 1989).

2/Domestic Resource Cost (DRC)

DRC is a measure and an indicator for efficiency of local resource usage in foreign currency in production and export. It was positive meaning that the country used its resources efficiently in producing cucumber (Person and Monke, 1989).

Table 3: Economic profitability indicators

| Indicator | Export |
|-----------|--------|
| EP | 7289 |
| DRC | 0.49 |

Source: computed from data collected and analyzed, 2013.

Protection coefficients:

1/ Nominal Protection Coefficient for outputs (NPC_o): It was less than one indicating that there were taxes levied on the products at the ratio of 14% (Table 4).

2/ Nominal Protection Coefficient for inputs (NPC_i): It was less than one indicating that there were subsidies for inputs at the ratio of 12% (Table 4).

Table 4: Protection Coefficients Indicators

| Indicator | Export |
|------------------|--------|
| NPC _o | 0.86 |
| NPC _i | 0.88 |

Source: computed from data collected and analyzed, 2013.

RECOMMENDATIONS

The study recommended that: reducing costs at all levels by reducing taxes and formulating policies encouraging production and export.

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