Journal of Marketing & Social Research
ISSN (Print): XXXX-XXXX
ISSN (Online): XXXX-XXXX
Volume: 01 | Issue 01 | July-Dec. | 2024
Journal homepage: https://jmsr-online.com/

Article

Feasibility Study of a business plan: Oil Production from Avocado

Melaku Tafese Awulachew

School of Chemical and Bio- Engineering (Chemical Engineering, Food engineering graduate study), Addis Ababa Institute of Technology, Addis Ababa, Ethiopia
Submission: 10/03/2024; Received: 28/05/2024; Revision: 25/06/2024; Published: 01/07/2024

***Corresponding author: Melaku Tafese Awulachew**

Abstract: The aim of this work is to investigate the feasibility of oil production from Avocado in Ethiopia. Being the soil nature, and the weather condition and of course the seasonality is ideal for Avocado cultivation, there is a wide production of Avocado in different area in Ethiopia. The gaps value addition program is important to removing or minimizing postharvest loss, we had engaged in studying the feasibility of the production of oil from avocado. Both market and economic feasibility has studied as it is indicated in their respective sub-sections. The market analysis reveals the availability of market gap. Because, avocado oil is most widely consumed fruit in Ethiopia, the country does not export this product to the international market due to limited production capacity but it is importing the palm oil and other type of oils in order to satisfy the demand. Economic feasibility investigation result also shows the profitability of the business idea, since, the net present value is positive which mean acceptable and viable for implementation.

Keywords: avocado oil, equipment sizing, technology, finical analysis, profit analysis.

INTRODUCTION

Agricultural production of Avocado has a large market as a fresh fruit, besides its use in the oil, cosmetic, soap, and shampoo industry; as well as processed foods derived from it, such as guacamole, frozen products and avocado paste (Téliz, 2000). Avocado was first introduced to Ethiopia in 1938 by private orchardists in Hirna and Wondo-genet and production gradually spread into the countryside where the crop was adapted to different agro-ecologies (Zekarias, 2010). Avocados are second in total volume of production, next to banana, in Ethiopia (Joosten, 2007). Annual avocado production in Ethiopia is 25633.16 tons (CSA, 2012/13). The largest constraints in Ethiopian agricultural markets are the limited amount of traders that have a scarce amount of capital together with a large amount of farmers, which leaves the farmers with a weak bargaining power (Mulat, 2000). Furthermore, limited information systems, poor packaging and preservation techniques, poor transportation, high handling costs and an underdeveloped sector are other limitations on the market.

Fruits and vegetables are both major food products in their own right and key ingredients in many processed foods (Wim Jongen, 2002). A basic idea on which all nutritional scientists can agree is that the increased consumption of diets rich in a variety of fruit and vegetables will improve the health of almost any human population, though some of the ways in which these foods enhance health have only become clear in recent decades (Pauline G. Scardina, 2009). Avocado like other vegetables and fruits is perishable agricultural commodity, and has a shorter shelf life in normal temperature. After harvest, micro-organisms, oxidation, enzymes naturally occurring in the avocado and sunlight rapidly change the physicochemical properties, color, flavor and texture of the avocados which all lead to both quantitative and qualitative losses of avocado. Avocado processing is one way of preserving the fruit. Therefore, feasibility assessment of the business should be done first before the physical erection of the processing plant to invite the investment opportunity for those capable based on the viability of the project. Hence, the overall objective of this material is to study the feasibility of oil production from Avocado in Ethiopia.

METHODS

Description of the Project

Ethiopia has a variety of vegetable crops grown in different agro-ecological zones produced through commercial as well as small farmers both as a source of income as well as food. The production of vegetables varies from cultivating a few plants in the backyards for home consumption up to a large-scale production for domestic and export markets. There is high yield of produce harvested. Avocado is biological structure, hence, can respire by taking up oxygen, and giving off carbon dioxide and heat, and transpire (i.e. lose moisture). Unless postharvest technologies are implemented only the fresh avocado market couldn't accommodate the existing yield of harvested crop. Consequently, there is a loss due to deterioration because readily available cultivated avocado is susceptible to oxidation, microbial and enzymatic spoilage.

Hence, establishment of avocado processing plant enables the perishable commercial crop subjected to value addition to extend the shelf life. As a result, the highly perishable fresh produce becomes available at reasonable prices during off season and low production periods, the crop grower is also saved from economic crises due to postharvest lose, can contribute in reducing the dependence of local demand on imported oil and hence, reduction of the country's foreign currency expense.

As a result, the feasibility study of avocado processing is considered as the subject of this project study because feasibility study is an effective way to safeguard against wastage of further investment or recourses. The project attempts to study the feasibility factors of avocado oil processing which includes: technical factors, market feasibility, financial feasibility, organizational feasibility, alternative technologies, and environmental impact avocado processing.

Technical Feasibility

The major technical factors of this business are the required facilities. These includes: size and type of production facilities, the need for related buildings and equipment's, suitability of production technology, availability and suitability of plant site, raw materials, commercial centers (banks), health centers (hospitals, clinics, pharmacies) and other inputs like: labours, qualified management personnel. Production facilities includes: electric power, water supply, communication technologies, transportation and its infrastructures, and also plant buildings and building materials which all are what can be obtained from the home country of the processing plant "Ethiopia".

The processing technologies (machinery and equipment) as well as auxiliary technologies required by the business plant is obtained from abroad. Since, the site is located where a full transportation infrastructure (for both land and air transport) existing, importing machinery and equipment is as such not difficult. As far as the production technology is environmentally friendly because there are no harmful and toxic wastes that are generated from the processing plant, and induces impact on the environment and the surrounding social. This show or implies the suitability of processing technology. Since the home country of the plant has been launching a program that invites investors for the available investment opportunities, and the town owns plane topography, the availability and suitability of plant site is facilitated issue. The basic raw material required for the processing plant is fresh avocado. Because the cultivation of avocado is near the plant site, raw material is easily accessible. Commercial centers (banks) and health centers are also available near the site.

Organizational Feasibility Study

Business structure is one organizational factor; it looks feasible, because, in the organizational structures of avocado processing plant, there is no requirement of highly specialized expertise, and expertise of advanced studies. Both skilled and unskilled labor forces are available and easily accessible in the country. Because, Ethiopia has around fifty higher educational institutes marketing graduates in field of studies (food science, technology, engineering, and accounting, marketing, and management) required for oil processing from avocado.

Market Feasibility Study

The need for avocado processing usually arises from a need to preserve the product for cooking purposes or to add value for extra income. Avocado processing is in its infancy stage in Ethiopia. Out of the various forms of processed avocado, the major product presently produced and consumed in the country is avocado juice. In Ethiopia, the number of fruits and processing industries is limited. Currently, there are only few fruits processing plants in the country (Rolien and André, 2009). Avocado processing is apparently limited to juice making where cafés, restaurants and juice houses takes the leads in cuisine preparation. Thus, there are only few agro-processing plant that underpin on avocado, and it has already ceased its endeavor of blending avocado to produce pasta and macaroni. But some Cosmetic Industry has launched producing of hair pomade by using avocado as raw material (Ayelech, 2011). Annual avocado production in Ethiopia is 25633.16 tons. The crop is now produced by 1,149,074.00 farmers countrywide who collectively farm more than 8938.24 ha of land in the south-western and other parts of the country due to more conducive climatic and edaphic factors (CSA, 2012/13). Unfortunately, there is no huge avocado processing factory in Ethiopia. However, in small-scale oil processor from avocado started up in the last recent years. Due to the high potential of raw materials availability in different part of the country, oil processing from avocado in large-scale factory is acceptable.

Site of Production

The area of the processing factory is established in Dilla town of Ethiopia. The reason is due to the reception of raw material from the southern part of the country. The factory is starting with full capacity. The processing plant will have a production capacity of 3,000 tonnes of processed avocado utilizing 100% of the fresh fruit produced, to estimate the supply and demand for avocado, the report on the 1999/2000 Household Income, Consumption and Expenditure Survey conducted by CSA and 11-4 published in February 2001 is used as a base.

Alternative Technologies

Avocado oil is processed product from dry plup avocado which used to consume in households, restaurants and institutions. The extractability and oil quality of avocado oil can be affected by factors such as fruit ripeness and pulp moisture and its corresponding dying method. Hydrolytic enzymes such as poly galacturonase and cellulases in avocado fruit degrade the parenchyma cells walls during ripening. As a result, the cell tissue is softened and more paths are created for the solvent accessing in the parenchyma cells (Mostert, M.E.; Botha, 2007).

Pressing Extraction

Pressing refer to oils are extracted by pressing or squeezing oily materials with screw press or hydraulic press. Pressing technology commonly used to squeeze oil from oilseed materials like sesame with relatively high oil content. Compared with oilseeds, avocado pulp contains higher moisture (about 77%) and its cellular contents are different. Water content of fruit pulp can significantly affect the oil yield. Pretreatment methods of avocado pulp, thus, can be different prior to pressing. The pretreatment approaches include (1) slicing and dying of avocado flesh, (2) microwave-oven drying and (3) the addition of solid additives. Traditional dying procedures such as oven-drying and sun-drying are time consuming to dry the slices to 4%–5% water content, accompanying with a relatively high risk of poor oil quality. In contract, microwave-oven drying process not only shortens the drying time, but also serves as a function of inducing cells structure disruption. Factors, such as quantity of samples, the intensity of microwave energy and time of microwave exposure, affect the oil extraction yield. (Moreno et al.2003) After sufficient mixing avocado pulp with solid additives, appropriate heating is required for subsequent squeezing. Such heating favors accelerating the disruption of cell walls during the extrusion process, making the decrease of the viscosity of cellular oil to increase the oil extraction yield. Besides, moderate heating favors the inactivity of lipases, which reduces or eliminates the hydrolysis of avocado oil during the squeezing and storage period.

Mechanical Assisted Centrifugalization

The mechanical assisted centrifugation follows the procedure as; Fresh avocado →flesh →diluted and pounded paste →held at suitable conditions →Centrifugation →crude oil (supernatant), (Werman, M.J.; Neeman,1987).

Material Balance

Assumption: The energy requirements in the avocado plant are mainly for pressing avocado powder concentration and avocado heating during pulping. A relatively small amount of electrical power will be needed for the operation of the electric motors, moving the pumps, conveyor belts, and the dryer. The oil extraction yield reached its lower level (less than 30%) when the energy was more than 2 kJ/g. A high temperature (>100°C) is accompanied by this high microwave energy, resulting in severe transforming the structure of idioblastic oil cells. Such transformed structure has a negative effect on the oil extraction yield. When the highest oil extraction yield by microwave-assisted squeezing was obtained at the optimized energy (1.89 kJ/g) the idioblastic cells became empty with no major changes. The addition of solid additives is another way to reduce avocado pulp's moisture and viscosity and to increase the oil extraction yield. Assumed plant processing capacity based on the raw material supply and available avocado oil market gap: 10tone raw avocados/day or 1.516 tone processed tomato paste/day

Material Balance

The consecutive material balances around each processing unit operation are calculated scaling up the assumed pilot scale processed avocado data to industrial scale by multiplying with assumed daily plant capacity. Out of a feed of 10t avocados per day, the following products and by-products are obtained:

Wasted avocado mass from sorting/grading step = (10,000 * 0.8)/7 =1,142.86 kg/day

Required washing water = (10,000 * 20)/7 = 28,571.43 kg/day

Mass of raw avocado to washing = (10,000 * 6.2)/7 = 8,857.14 kg/day

Waste (washing water plus waste from washed avocados) = (10,000 * 20.2)/7 = 28,857.14 kg/day

Mass of avocados into the peeler = (raw avocados mass – mass of wasted avocados – mass of waste removed during washing) = (10,000 – 1,142.86 – 285.71) kg = 8,571.41 kg/day

Solid and water released mass = (10,000 * 2.61)/7 = 3,728.57 kg/day

Oil mass = (10,000 * 1.19)/7 = 2,728.58 kg/day

Mass of steam required for peeling = Q (heating energy rate)/h (enthalpy of steam used) = (mass flow rate of avocados * specific heat capacity of avocados * temperature difference)/h = (8,857.14 kg/day * 3.01 kJ/kg k * (323.15 – 298.15) k)/316.5 kJ/kg = 2,108.64 kg/day

Therefore, total mass of steam required per day = 2,728.58 kg/day + 2,108.64 kg/day =4,837.22 kg/day

Total mass of materials to the mixing step in byproduct treatment section = mass of wasted avocados + mass of Pomace = (1,142.86 + 3,728.57) kg/day = 4,871.43 kg/day

Total material into the presser = The amount of oil = 2,728.58 kg/day

Applying aver all and component material balance on presser gives:

Overall balance: 2,728.58 kg/day = mass of pressed Pomace (x) + mass waste water (y)

Component solid balance: (2,728.58 * 0.235) = 0.4x + 0.07y, x = (641.216 – 0.07y)/0.4

Therefore, mass of pressed Pomacea and mass of waste water is 1,364.4 kg/day and 1,364.4 kg/day respectively.

Applying aver all and component **material balance on drier:**

Component solid balance: 1,364.4 kg/day = mass of dried Pomace (x) + mass of water removed (y)

Overall balance: (1,364.4 * 0.4) = 0.92x.

Therefore, mass of dried Pomacea and water removed is 593.22 kg/day, and 771.18 kg/day respectively.

Equipment Sizing and Design

To produce Avocado the equipment required:

- Washer:

  Mass incorporated into washer =mass of water +mass of avocado = 1,190.48 kg/hr + 369.05 kg/hr = 1,559.53 kg/hr

  V1 (volume of water) = mass water/density of water = (1091.3 kg)/(1000kg/m3) = 1.2 m3

  V2 (volume of avocado) = mass/density = (369.05 kg)/(1750kg/m3) = 0.21 m3 , Density of Avocado = 1750kg/m^3

  Vtotal = v1+v2 (volume of washer) = (1.2 + 0.21) m3 = 1.41 m3
- Peeler:

  Mass of avocados into the peeler = 8,571.41 kg/day = 357.14 kg/hr

  The avocados are heated from room temperature (25^{O}C) to 50 ^{O}C peeling temperature

  Therefore, the heating load of peeler is quantity of heat required to bring up the temperature of avocados from 25^{O}C to 50 ^{O}C

Peeler heating load = mass of avocados*(Cp. avocados*temperature difference* Peeler heating load = (357.14 kg/hr)(3.01kJ/kg.k)(50 - 25)k = 26,874.8 kJ/hr

- **Aseptic packer:**

Avocado oil mass = 2,728.58 kg/day, Oil density = 920 kg/m^3
Volume of packer = mass/density = (2,728.58 kg)/ (920 kg/m3) = 2.66 m^3

- **Screw press:**

The total material into the presser = 2,728.58 kg/day. Therefore, the pressing capacity of screw press is = 2,728.58 kg/24hr = 113.7 kg/hr

- Dryer:

The design of industrial dryers in food processing is based mainly on practical experience, since handling and processing of solid and semi-solid food materials cannot be described adequately by mathematical models and computer simulations (George D. Saravacos et al, 2003).

Financial/Economic Feasibility Study

Table 2. Equipment list with their corresponding size and cost

Equipment type	Size	Quantity	Cost per unit	Subtotal cost
Washer	12,500 litter/day	1	$20,000	$20,000
Pulper	10 ton/day	1	$12,500	$12,500
Dryer	7.5 ton/day	1	$12,500	$12,500
Hydrolic presser	6 ton/day	1	$39,000	$39,000
	Total purchased Equipment cost (PEC) = $84,000			

Estimation of Direct Cost (DC)

It is the expense or costs which are directly involved with material and labor in actual installation of complete facility, includes the following:

Purchased equipment cost (PEC) = $ 84,000
Installation, insulation and painting cost (20-40) % of PEC, taking 20% of PEC, Installation, insulation and painting cost = 20% *$84,000= $ 16,800

Instrumentation and control system installation (5-20) % of PEC, taking 5% of PEC, Instrumentation and controlling system cost = 5%* $84,000= $4,200

Electrical installation cost (10-40) % of PEC, taking 10% of PEC, Electrical installation cost = 10% * 84,000$= $8,400

Buildings, process & auxiliary cost (10-35) % of PEC, taking 10% of PEC, Buildings, process & auxiliary cost = 10% * $84,000= $8,400

Service facilities and yard improvement cost (25-100) % of PEC, taking % of PEC, Service facilities and yard improvement cost = 25%* $84,000= $21,000
Land (4-8) % of PEC, taking 4% PEC, Land cost = 4% *$84,000= $3,360

Dc = PEC + Insulation and painting cost + Instrumentation and control system installation +Electrical installation cost + buildings, process and auxiliary cost + Service facilities and yard improvement cost + Land cost = 146,160$

Estimation of Indirect Cost (IC)

Engineering and supervision cost (5-30) % of DC, taking 5% of DC,
Engineering and supervision cost = 5% *146,160$= $7,308Construction expense and contractor fee (6-30) % of DC, taking 6% of DC, Construction expense and contractor fee = 6%*$146,160 = $8,769.6

Contingency (5-15) % of fixed investment cost (FCI), taking 5% FCI,
FCI = DC + IC= 146,160$+ (engineering and supervision + construction expense and contractor fee + Contingency).

FCI = 170,776.42$, Contingency = 5% * FCI = 8,538.82$, IC = FCI – DC = 24,616.42$

6.3 Estimation of Working Capital and Total Capital Investment

Working capital investment, WCI is 10-20 % of TCI, taking10% WCI = 0.10 TCI…(eqn.1)
TCI = FCI + WCI=170,776.42$ + 0.10 TCI 0.9TCI =189,751.58$

Therefore from eqn.1: WCI = 0.10TCI = 0.10 * 189,751.58$= 18,975.16$

Estimation of Total Product Cost (TPC)

TPC = Manufacturing cost + General expenses; Manufacturing cost = direct product cost + fixed charge + plant overhead cost; Direct product cost = raw materials + operating labor + utilities + maintenance and repair cost.
Raw materials = 10,000 kg/day * 300 = 3,000,000 kg/year; raw material cost is = 3,000,000 * 0.4$ = 1,200,000$
Operating labor = 5-15%TPC, taking %, operating labor cost = 0.05 TPC; Utilities cost is 5-15%TPC, taking 5%, utilities cost = 0.05 TPC; Maintenance and repair 2-10 %FCI, taking 2% of FCI,

Maintenance and repair cost = 0.02 FCI = 3,415.53$

Direct product cost = raw materials + operating labor + utilities + maintenance and repair

= 1,200, 000$ + 0.05TPC + 0.05TPC + 3,415.53$ = 0.1TPC + 1,203,415.53$

= 0.1*TPC + 1,203,415.53$

Fixed charge = depreciation + insurance

Depreciation = 0.1 * FCI = 0.1 * 170,776.42$ = 17,077.64$; Insurance = 0.5-1%FCI, taking 0.5%, insurance = 0.005* 170,776.42 = 853.88$; So, fixed charge = 17,077.64$ + 853.88$ = 17,931.52$

Plant overhead cost= 5-15%TPC, taking 5%; plant overhead cost = 0.05TPC; General expenses = Administrative cost + distribution and selling cost; Administrative cost = 2-6%TPC, taking 2%, administrative cost = 0.02TPC; Distribution and selling cost = 2-20%TPC, taking 2%, Distribution and selling cost = 0.02TPC.

General expenses = 0.02TPC + 0.02TPC = 0.04TPC and hence, TPC = Manufacturing cost + General expenses = (0.1TPC + 1,203,415.53$ + 17,931.52$ + 0.05TPC) + (0.02TPC + 0.02TPC) = 1,507,835.86$

Operating labor = 0.05TPC = 0.05 * 1,507,835.86$ = 75,391.79$; Utilities cost = 0.05TPC = 75,391.79$; Plant overhead cost = 0.05TPC = 75,391.79$; Administrative cost = 0.02TPC = 30,156.72$; Distribution and selling cost = 0.02TPC = 30,156.72$

Profit Analysis

Cash Flow

Assumption: All investment expenses are owners' equity, A kilogram of avocado (raw material) obtained in 0.4$ /kg, Annual production capacity utilization: 100%, and Annual working days: 300days/year.

The supposed individual pack contains 1L Avocado oil. So, the total annual number of packed and marketed product is = (annual production in litter/year), 2kg=341ml, then 3,000,000kg*340ml/2kg = (510,000L /year) = 510,000 litter/year. (2kg = 9 avocados were dried and then pressed, producing 340g of oil. The density of avocado oil (0.92g/ml) was taken from known data tables and used to calculate the volume of oil extracted per avocado: 41ml of oil per avocado (IDDS 2014 - Tanzania). Assumed pricing method is penetration pricing (below market), 4 $/litter. Annual income from selling the product = (4$/litter * 510,000) = 2,040,000 $

Tax: 35% Gross earning

Table-2. Cash flow

Y e a r	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Capacity utilization (%)		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
I. Cash inflow		2,124,000	2,106,922	2,089,845	2,072,767	2,055,689	2,040,000	2,040,000	2,040,000	2,040,000	2,040,000
Revenue ($)		2,040,000	2,040,000	2,040,000	2,040,000	2,040,000	2,040,000	2,040,000	2,040,000	2,040,000	2,040,000
Salvage value ($)		84, 000	66,922	49,845	32,767	15,689	-	-	-	-	-
II. Cash Outflow	2,618,945	1,504,420	1,504,420	1,504,420	1,504,420	1,504,420	1,504,420	1,504,420	1,504,420	1,504,420	1,504,420
Investment ($)	2,618,947	-	-	-	-	-	-	-	-	-	-
Raw materials		1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Utilities ($)		75,392	75,391	75,391	75,391	75,391	75,391	75,391	75,391	75,391	75,391
Operation labor		75,391	75,391	75,391	75,391	75,391	75,391	75,391	75,391	75,391	75,391
Factory overheads		75,392	75,391	75,391	75,391	75,391	75,391	75,391	75,391	75,391	75,391
Admin. Cost		30,157	30,156	30,156	30,156	30,156	30,156	30,156	30,156	30,156	30,156
Distribution &selling		30,156	30,156	30,156	30,156	30,156	30,156	30,156	30,156	30,156	30,156
Depreciation		17,078	17,077	17,077	17,077	17,077	17,077	17,077	17,077	17,077	17,077
Insurance ($)		853.88	853.88	853.88	853.88	853.88	853.88	853.88	853.88	853.88	853.88
Gross Profit (I-II)	-2,618,945	619,560	602,502	585,424	568,347	551,269	535,580	535,580	535,580	535,5780	535,580
Tax (35%)	-	-	-	-	-	-	187,453	187,452	187,453	187,453	187,453
Net profit	-2,618,	619,57	602,50	585,42	568,34	551,26	348,12	348,127	348,127	348,127	348,127
	946.98	9.63	2.03	4.39	6.75	9.11	6.79				

Payback Period

Year	0	1	2	3	4	5
Cumulative Cash flow	-2618946.98	-1999367.35	-1396865.32	-811440.93	-243094.18	308174.93

Yearly cash flow - 243,094.18 551,269.11

Payback period = 4 years + 243,094.18/551,269.11 = 4.44 years

Break-even and ROR Analysis

Break-even point is the production volume at which there is no loss or profit. At that pointy any revenue obtained will be sufficient to cover only the fixed costs.

(Unit selling price – unit variable costs) production volume = total fixed costs (4$/litter – 0.8$/litter)

Break−Even Volume = 510000/(159,375L/year) = 3.2

ROR=Net profit *100% = 551,269.11 *100% = 21.05%
Total investment 2,618,946.98

Table 3. **PV, NPV, and NPVR Analysis**

Year	0	1	2	3	4	5	6	7	8	9	10
Cash flow	$-2.6*10^6$	$1.4*10^6$	$1.2*10^6$	$9.6*10^5$	$7.3*10^5$	$4.9*10^5$	$2.9*10^5$	$2.9*10^5$	$2.9*10^5$	$2.9*10^5$	$2.9*10^5$
Discounting Factor at 12%	1	0.893	0.797	0.712	0.636	0.567	0.506	0.452	0.404	0.351	0.322

A. PV $-2.6*10^6$ $1.3*10^6$ $9.6*10^5$ $6.8*10^5$ $4.6*10^5$ $2.8*10^5$ $1.5*10^5$ $1.3*10^5$ $1.2*10^5$ $1*10^5$ $9.3*10^4$

B. NPV = \$ $1.7*10^6$ (by addition of all PVs, including the initial investment outlay, which is negative because it is a cash outflow

C. NPVR= ∑NPV of NCFs = 43,00,000 = 1.65

NPVI 2,600,000

CONCLUSION

The net present value is positive and the net present value ratio is greater than 1 the project is acceptable and viable for implementation. Moreover, the payback periods of 4.44 years apparently minimize any risk in regaining the initial investment. The most critical determinants of the viability of the project are NPV and PI which in this case are adequate to avoid any doubts about the project's viability. Since, the study confirmed the feasibility and workability of the business idea. Hence, Avocado processing is a business opportunity that is yet to be fully exploited. Therefore, as a recommendation for those who have a potential of investing, if they run this business idea, they can succeed.

Conflict of interest:
The Authors declare no conflict of interest.

REFERENCES

1. Ayelech, T. (2011). *Market chain analysis of fruits for Goma woreda Jimma zone, Oromia regional state'.* A Thesis Submitted to School of Graduate Studies of Haramaya University.
2. CSA. (2013). Agricultural Sample Survey 2012 / 2013; Volume I, Report on Area and Production of Major Crops, Statistical Bulletin 532; Addis Ababa, Ethiopia.
3. Dreher, M. L., & Davenport, A. J. (2013). Hass avocado composition and potential health effects. *Crit. Rev. Food Sci.Nutr, 53,* 738-750. https://doi.org/10.1080/10408398.2011.556759
4. Edossa, E. (1997). *Selection of Avocado (Persea Americana.) Collection of Desirable Fruit Characteristics and Yield at Jimma.* Proceedings of the 8th Annual Conference of the Crop Science Society of Ethiopia, Feb. 26-27, Addis Ababa, Ethiopia, pp: 26-35. Education Ltd, London.
5. Garedew, W., & Tsegaye, B. (2011). 'Trends of Avocado (Persea americana) Production and its Constraints in ManaWoreda, Jimma Zone: A Potential Crop for Coffee Diversification. *Journal of Trends in Horticultural Research, 1,* 20-26. https://doi.org/10.3923/thr.2011.20.26
6. George, D. S., & Zacharias, B. M. (2003). *Food Process Design.* Marcel Dekker, Inc, 270 Madison Avenue, New York, NY 10016, USA.
7. Mostert, M. E., Botha, B. M., Plessis, L. M. D., & Duodu, K. G. (2007). Effect of fruit ripeness and method of fruit drying on the extractability of avocado oil with hexane and supercritical carbon dioxide. *J. Sci. Food Agric. 87,* 2880-2885. https://doi.org/10.1002/jsfa.3051
8. Ozdemir, F., & Topuz, A. (2004). Changes in dry matter, oil content and fatty acids composition of avocado during harvesting time and post-harvesting ripening period. *Food Chem., 86,* 79-83. https://doi.org/10.1016/j.foodchem.2003.08.012
9. Pieterse, Z. A. *(monounsaturated fatty acids), weight loss and serum lipids.* Energy
10. Rolien, C. W., & Andre, de J. (2009). *Business Opportunities in the Ethiopian Fruit and Vegetable Sector.* Retrieved from http://www.lei.dlo.nl
11. Téliz, D. (Coordinator). *2000. El aguacate y su manejo integrado.* Ediciones Mundi-Prensa. México.
12. Wim, J. (2002). *Fruit and vegetable processing Improving quality* (1st ed.). Woodhead Publishing Limited, Abington Hall, Abington Cambridge CB1 6AH, England.

Zekarias, S. (2010). Avocado Production and Marketing in South Western Ethiopia. *Journal of Trends in Agricultural Economics, 3*(4), 190-206. https://doi.org/10.3923/tae.2010.190.206