

OPEN SOURCE ECOLOGY BOTSWANA (OSEB)

Introduction:

Open Source Ecology Botswana or OSEB is a not-for-profit established to produce open source machines in Africa and teach the general public about the open source movement as well as train people, young and old to become makers, shifting the paradigm from consumers to producers. The primary goal of OSEB is to empower **Africans** with the tools and the means to create locally made open source machines, to reduce reliance on centralised global corporations whose self interest is in profits regardless of the cost to communities or the environment.

OSEB is modelled on Open Source Ecology, a non profit organisation based in Missouri, USA and dedicated to the development of the Global Village Construction Set (GVCS). “The **Global Village Construction Set** (GVCS) is a modular, DIY, low-cost set of blueprints that enables fabrication of the 50 different Industrial Machines that it takes to build a small, sustainable civilization with modern comforts” ([GVCS](#)). The GVCS enables the creation of sustainable communities, communities that are self-sufficient and self-reliant but, however, not isolated. “Rather, the Global Village concept is about people and communities networked world-wide, sharing knowledge and trading goods” ([Global Village Concept](#)). Central to the core beliefs of OSE and OSEB are collaboration on a global scale and the open sharing of information to further develop the GVCS machines making them better, cheaper, stronger, longer lasting, repairable than their commercial counterparts produced by centralised global companies. OSEB’s mission is to shift the economic mindset from proprietary to open collaboration.

“So, what makes the Global Village concept unique? It’s about local people producing the essential needs of the regional community. In the global village, people are not dependent on foreign oil reserves or goods from China. The global village requires producers of local goods. For example, if you want to “eat locally”, you need local farmers. It is about much more than food. OSEB believes there is no reason why all the essentials that people use everyday should not be produced locally. It could include hybrid cars, biofuels, solar energy, medicines – all the basics - and possibly up to advanced technologies such as solar cells, computer chips, and aluminium extracted from clay. The Global Village Construction Set is a

combination of tools and knowledge that makes local production feasible. It's full of everything from saving and growing seeds that are adapted to the local climate to designing and building equipment that will last a lifetime, freeing communities from the bonds of planned obsolescence, expensive, specialised parts and equipment junkyards. " ([Global Village Concept](#)).

Africa is littered with thousands of broken machines brought in by well-meaning third world aid projects bringing in industrial machines but for reasons of weak supply chains or lack of social assessment and because the technology was not appropriated by the local population or parts were not available and as soon as the machines broke they could not be repaired. The concept of the microfactory is local production from resources in Africa by Africans. Microfactories springing up throughout Africa creating a network of [Distributive Enterprises](#) making machines in Africa, machines that are repairable, modular, scalable and most of all machines that will last a lifetime. With open source collaboration these microfactories will collaborate on innovations to improve open source machines making them better, faster, stronger and more durable than their proprietary counterparts. Open Source Microfactories will be spearheading the substitution of proprietary goods with locally produced open source alternatives which will be cheaper, better, ecologically sustainable and designed to last a lifetime.

At the heart of OSEB is the microfactory, a workshop facility measuring 300square meters, for fabricating open source machines, prototyping and testing new machines, training people in the practical skills needed to produce the GVCS machines and become local makers or entrepreneurs. The Compressed Earth Brick (CEB) press is one of the first machines that will be fabricated in the microfactory. The CEB press, aptly named the Liberator, so named to liberate people from one of the biggest costs in their lives, housing. Houses built from CEBs are both cheaper and more environmentally friendly than their standard brick or cement block counterparts. Building with earth has been around for thousands of years, including our own rondavels in our villages. CEBs have revolutionised building with earth making it comparable to modern fired clay brick and concrete buildings yet much more sustainable. OSEB is also committed to solving the pressing world issue of lack of affordable housing.

The microfactory will be manufacturing the [lifetrac](#) and the [microtrac](#), a full size open source tractor and a smaller version tractor. These are multipurpose machines which can be used in various enterprises like providing lifting power in a CEB making facility or in agricultural enterprises for ploughing, **seeding** and other agricultural operations. The lifetrac and microtrac can be fitted with a range of implements all made in the microfactory and include [spaders](#), [rototillers](#), [trenchers](#), [backhoes](#) and [seeders](#) amongst others.

OSEB Microfactory Set-up:

The first OSEB microfactory OSEB-Botswana will be located at Mantshadidi, Botswana just outside Palapye. This location is strategic being in the centre of Botswana with easy access to both the north and the south of the country as well as being close to the [Botswana International University of Science and Technology](#) (BIUST) with which we intend to forge close collaborative links both for providing practical skills training space for students to apply their theoretical knowledge as well as a platform for R & D for open source machines advancing the development of the GVCS 50 machines to product ready stage.

Steps to establishing the OSEB-Botswana Microfactory:

Land allocation: approximately 92.8 hectares of ploughing fields made up of six fields granted by the Serowe Land-board Coordinates TBA.

1st step: establish a reliable and stable water supply and storage:

Borehole drilling at BWP300/m, safe depth 200m = BWP60,000.

Solar PV panels plus battery plus borehole pump and accessories estimated at P180,000.

Additional P60K for contingencies and storage tanks - total = P300K for water supply and storage.

2nd step: Establish power source: 150 KVA diesel powered generator set @ P70K for start-up operations and will be relegated to providing emergency power once off-grid PV power supply for the microfactory and educational campus is established. Once the main PV system is set up the diesel powered genset will be converted to use green fuel sources such as gas from a [gasifier](#) or [hydrogen](#).

3rd step: Lay foundation for 300m² microfactory/ workshop and [universal prototyping structure](#) for the construction of the large workshop. Cost of foundation and rebar space-frame pillars that make up the universal prototyping structure are estimated at P60K.

Roofing of the workshop will be with PV panels to supply off-grid power to the facility, this is [Roofless Roof](#) Concept. Estimate of PV panels plus power storage nickel-iron batteries and inverters P1,056K ([Africa Budget](#)).

4th step: Equipping the microfactory with the basic advanced tools needed to fabricate the open source machines in the GVCS. The [Basic Advanced Workshop](#) which allows for the production of many GVCS machines - which also features the efficiency required for [Extreme Manufacturing](#) rapid builds - contains these 7 tools:

1. CNC Torch Table for cutting steel parts - [\\$12k off-shelf](#);
2. 120 Ton Iron-worker machine for rapid shearing and hole punching of 1" thick metal - [\\$21k off-shelf](#);
3. CNC Mill - [\\$17k used off shelf](#);
4. CNC Lathe - [\\$15k used off shelf](#) - [\\$4k OSE after CNC addition](#)
5. Heavy Duty Drill Press (2" hole drilling capacity) - [\\$10k off shelf](#) - [\\$600 OSE](#)
6. 200 Amp MIG Welder - [\\$2k off shelf](#) - \$500 OSE
7. Acetylene Torch - [\\$400 off shelf](#)

Total - \$77,400 off shelf

Once water supply and electricity are established and the workshop foundation, universal prototyping structure and PV Roofless Roof are in place, as well as the Basic Advanced Workshop tooling secured, work can begin immediately on fabricating the first open source machines namely the CEB press and it's power source, the [Power Cube](#). Construction of the CEB press and power cube will enable the production of CEBs which will be used to complete the workshop structure's walls. The ability to produce CEBs creates a business enterprise with sale of CEB presses, CEBs, building of structures from houses to warehouses and everything in between. The OSEB fund raising unit will be used to bootstrap finance to cross subsidise the development of other open source machines to establish other business units. From the CEB press the infrastructure of the OSEB-B campus can be built, building staff housing, dormitories for students, kitchen and dining facilities, classrooms, as well as self catering cabins to house short term workshop attendees. The primary goal of OSEB-B is to empower **Batswana** by teaching them how to build open source machines which can then be used to establish enterprises that provide a stable livelihood for themselves

The microfactory is the heart of OSEB. With the microfactory, following on from the fabrication of the CEB press comes the construction of the Lifetrac and microtrac tractors

which are multipurpose machines which can be used to enhance productivity in a CEB enterprise and to establish an agricultural equipment supply unit. OSEB-B's agricultural unit has the primary goal of creating food self-sufficiency at OSEB-B as well as creating enough surplus to sell at local markets in and around the Central District area. Farmland will be dedicated to conventional agriculture using open source tools, hydroponics as well as [Small Scale Aquaponics Food Production](#). OSEB-B will also engage in animal husbandry, raising chickens, ducks, goats, sheep and cattle in order to feed OSEB-B residents as well as providing an income stream supplying local markets as well. Central to the philosophy of OSEB is to be self-sufficient, therefore any project that OSEB engages in must provide a positive Return on energy and effort, i.e. be a viable enterprise.

3D printing has the potential to revolutionise manufacturing and rapid prototyping bringing into reach of small manufacturers and producers. OSEB will produce Open Source 3D printers that are affordable for the small local communities. OSEB-B will be engaged in producing, in the first instance, the D3D Printer series developed by OSE USA. OSEB-B will be taking up the gauntlet to further develop these 3D printers to enable printing using waste plastic as a way to address waste plastic pollution, printing with metal and other high temperature thermoplastics. 3D printing capabilities open a whole new range of possibilities for the small enterprise manufacturer from printing shoes, motor car parts, light fittings, jewellery and accessories, nuts and bolts and a whole myriad of complex geometric shapes. OSEB-B will be engaged in the production of 3D printers and kits for sale, in the further development of 3D printer technology in collaboration with OSE USA, BIUST and other collaborators, in teaching people how to make open source 3D printers through workshops run at OSEB-B site.

With the establishment of the CEB press and the Building unit as the backbone structure to fund the open source revolution as well as being energy and food self-sufficient, OSEB-B will be in position to its primary aims: which is the further development and completion of the GVCS machines making all 50 machines product ready in collaboration with all OSE campuses worldwide. The [GVCS](#) machines are broken down into 6 areas that cover all the basics needs of humanity. These are:

- Habitat;
- Agriculture;
- Industry;
- Energy;
- Materials; and
- Transportation.

Habitat covers all the machinery needed to provide for the basic human need of shelter. The CEB press, cement mixer or soil conditioner, sawmill, bulldozer and backhoe machines are listed in this category.

In agriculture the GVCS machines include: the lifetrac and microtrac tractors, bakery oven, seeder, soil pulverizers, dairy milker, spader, hay rake, hay cutter, trencher, [microcombine](#), baler and well-drilling rig.

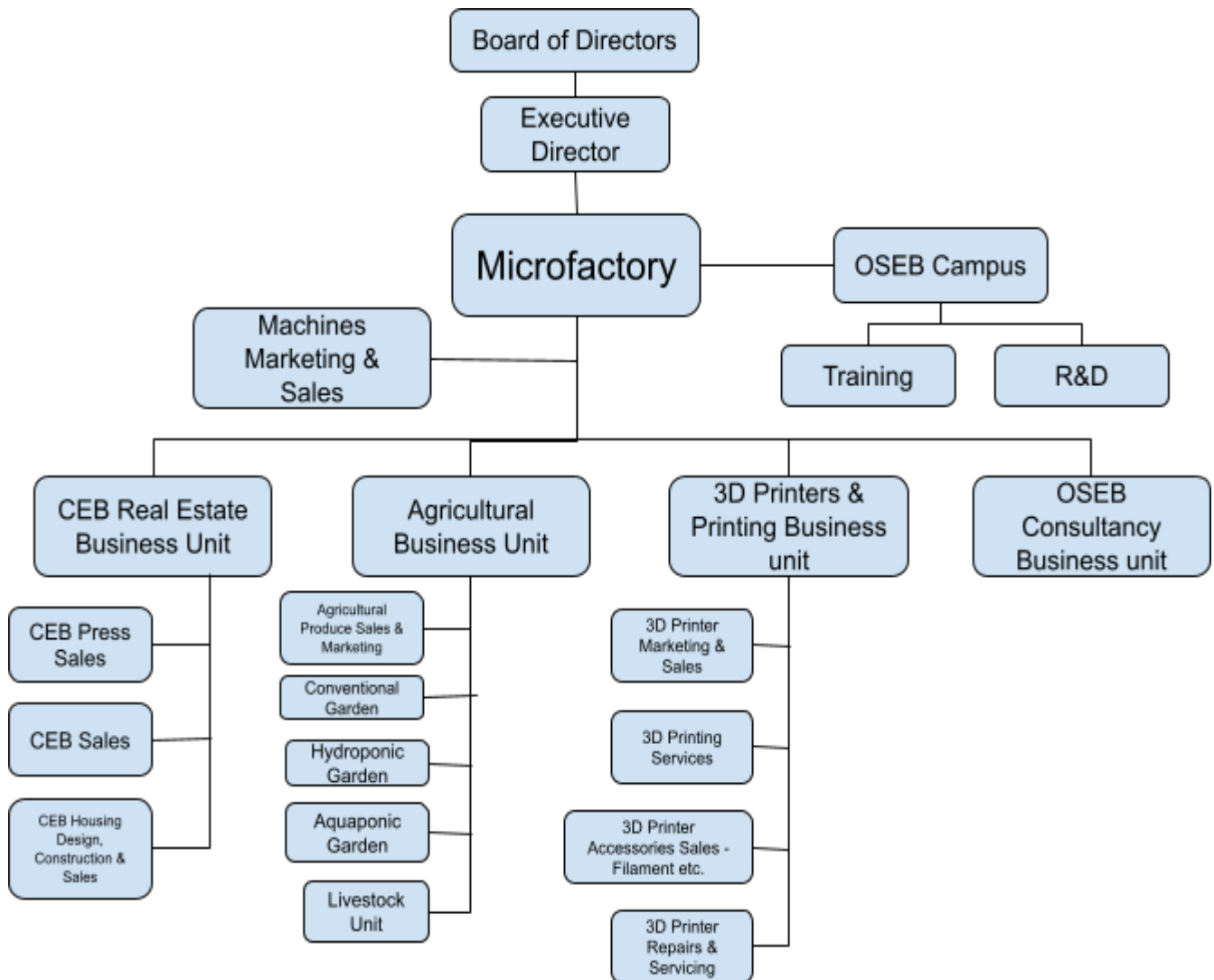
In the Industrial machines category these are machines which provide the backbone of the microfactory. Machines that are used to make other machines. These include the multimachine, CNC Torch Table, CNC Circuit Mill, 3D Printer and 3D Scanner, Drill Press, Metal Roller, Induction Furnace, Rod and Wire Mill, Press Forge, Industrial Robot, Laser Cutter, Welder, Plasma Cutter, Universal Rotor and Chipper Hammermill.

The Energy category involves devices to capture and convert energy to forms that can be easily stored and used. These include [Steam Engine](#), Nickel-Iron Batteries, Power cube, Gasifier Burner, Heat Exchanger, Solar Concentrator, Wind Turbine, Electric Motor/Generator, Pelletizer, Hydraulic Motor and Universal Power Supply.

The Materials category involves the extraction of raw materials that can then be used to make machines or be used as inputs to other machines. Examples are [Aluminium Extractor](#) and the [Bioplastic Extruder](#).

Transportation is essential to transport people as well as goods produced at OSEB-B from point A to point B. Open source Cars, Trucks and Aerial Transportation vehicles including drones and aircraft will be developed and produced as part of the GVCS.

OSEB-Botswana Structure:



Microfactory Business Plan

1 Introduction

2 Executive Summary

3 Vision, Mission and Values:

3.1 Vision:

To create a facility to fabricate open source hardware that will be of benefit to all mankind

3.2 Mission:

To be the first open source microfactory in Africa and serve as template for replication of the microfactory in communities all over Botswana, Southern Africa, Africa at large and the rest of the world

3.3 Values

- **Open Source Culture** - we collaborate openly, publishing early and often - even if 'conventional economic wisdom' would advise against it. We give know-how and experience freely to the world, and monetize our effort by producing real goods and services - not by creating monopolies or selling non-scarce goods. We work on our self-esteem so we can be open and vulnerable.
- **Transformative Approach** - we study history and aim to create something that is needed but difficult to achieve - to enable all of humanity to attain self-determination and happiness. We view the long term to achieve needed breakthroughs, and solve hard problems. We are absolute creators.
- **Systems Thinking** - We think in systems, understanding that everything in nature is connected. We respect nature, and we produce a diversity of options.
- **Constant learning** - we accept praise, but always ask what we could do better. We dedicate time to learning.

- **Be excellent to each other** - [Botho](#) - We respect and uplift our co-workers. We turn our team members into friends. We do not work with assholes (Pardon our French!).
- **Integrated Humans** - We are on a path to becoming integrated humans - as that is how we foster democratic culture.
- **MTP** - [Massive Transformative Purpose](#) - We focus on important, timeless issues. We create new economic models and [dogfood](#) them.

3.4 Objectives

- 3.4.1 To fabricate open source hardware starting with the CEB Press, Power cube and 3D printer
- 3.4.2 To further develop the 50 GVCS machines to product ready stage
- 3.4.3 To collaborate openly globally with other microfactories and Open Source organisations and collaborators

3.5 SWOT Analysis

Internal	External
Strengths: • Open collaboration on a global scale creating better, cheaper, stronger products than commercial counterparts • Readily available open source hardware products for replication • Mentoring and support from OSE Missouri • Available land in strategic location - Mantshadidi	Opportunities: • First mover advantage spearheading establishment of microfactories all over the continent • Access to US Dollar market via OSE Missouri • The long learning curve in establishing an OS Machine manufacturing business acts as barrier to competition
Weaknesses: • Lack of Strong marketing and sales skills • Leadership team not yet established • Insufficient cash resources	Threats: • Readily replicable open source hardware, so larger more established competitors could jump into producing the same machines. • Lower barrier to entry for new comers increasing competition

3.6 Strategies

3.6.1 The following critical strategies will be actively pursued:

- Create a platform for communication and sharing of ideas in order to create a group of like minded individuals interested in collaboration and an open source mindset - OSEB WhatsApp Group invitation link:
<https://chat.whatsapp.com/LSu1cKbKJFpCTijWnlclwd>
- Telegram chat for wider OSE Africa group:
https://t.me/+fgZgRUz_hII3Njk1
- Creating partnerships and networking with possible stakeholders, including BIUST, relevant government departments and other agencies such as SEZA, CEDA and LEA and any other party wishing to collaborate with OSEB;

- Create a leadership team of like minded individuals to spearhead the OSEB Microfactory project
- To continually promote OSEB products at trade shows and agricultural shows in and around Botswana, eventually expanding regionally.

3.7 Goals / Targets

- Establish and equip a microfactory at Mantshadidi by year end 2022/ beginning of 2023
- Develop inhouse capabilities to fabricate the CEB Press, Power Cube, 3D Printer, lifetrac and microtrac within 3 - 9 months of microfactory setup
- Get and train at least 4 master fabricators in collaborative literacy and open hardware design, development and fabrication within 6months of microfactory operation

4 Present Status

4.1 Background

OSEB is inspired by [OSE](#) Missouri which was founded by Dr. Marcin Jakubowski in 2008 and since then has been working on designing, developing and building the machines that make up the GVCS. So far machines that have been prototyped include the CEB press, the Power Cube, the Lifetrac and Microtrac tractors, 3D printer, backhoe, trencher, soil pulveriser, CNC torch table and iron worker. All the plans and instructions to build these machines are open source and freely available for all mankind on the OSE wiki pages.

The land for the establishment of the OSEB Microfactory is available at Mantshadidi near Palapye, totalling approximately 128 hectares. Water supply and electricity supply need to be established namely through borehole drilling and equipping and initially from a diesel generator. Funding to begin infrastructure works needs to be secured for borehole drill, buying a genset, laying the foundation, universal prototyping structure and roof for the microfactory.

Living accommodation and toilets will need to be established as well, as work begins on the infrastructure.

4.2 Progress to Date

4.2.1 Sales and Marketing

Interest in the purchase of one CEB press has been expressed by one party in Gaborone. Cost of fully built CEB Press, materials and labour is US\$10K. To run the CEB press a power source is needed such as tractor power take-off (PTO) or the open source power cube can be used. Cost of the Power Cube is US\$4K fully built. The CEB Press is fully automated and can produce 6 to 10 CEBs per minute. By comparison the commercially produced CEB machine made by [Hydraform South Africa](#), costs ZAR353,500 (US\$22K) and produces 4.5 blocks per minute.

4.2.2 Operations and Management

The Microfactory will operate using 14 apprentices recruited to learn how to design and build open source hardware. The facility will double as a production facility as well as a learning facility for the apprentices where they will put into practice theory learned. As apprentices become skilled fabricators, they can continue to work with OSEB as fabricators and trainers for new apprentices or they can go on to start their own open source hardware enterprises.

OSEB will put together a management team to formulate and guide the development of OSE-Mantshadidi.

4.2.3 R&D

OSEB is a social enterprise based on the 50 GVCS machines envisioned by OSE. The development of these 50 machines is on-going and by producing machines in OSEB's microfactory and making improvements which in turn will feed back into the further development of the 50 GVCS machines, OSEB and OSE as well as collaborators from all over the **global** will work together to design, develop, prototype and productise all the 50 GVCS machines.

4.2.4 Finances

The OSEB Microfactory project is based on obtaining a manufacturing loan from CEDA up to the limit of P4 Million, at an interest rate of 7.5% and repayable over 15 years.

4.2.5 Other Developments

In tandem with the Microfactory production of machines, the machines produced will also be used to start other supporting and complimentary enterprises. For example with the CEB press a building construction business will be started to produce CEBs for sale and also engage in construction of private and commercial buildings as well as participating in government tenders to build schools and other communal buildings.

OSEB is intended to be a self-sufficient community, off-grid and producing all the food it needs as well as selling to the local community in which OSEB operates.

4.3 Key Features

Key features of Open Source Hardware are that the designs to build the machines are open and not proprietary. There are no patents and customers of OSEB retain the right to repair machines they have purchased. OSEB also will invite potential customers to participate or observe the fabrication of their machines in order to understand how the machine is put together thus making it easier to maintain.

OSE Machines are built to last a life-time, to be the last machine you will ever need to buy, without built-in obsolescence.

4.4 Main Benefits

- Life-time design;
- Cheaper than equivalent commercial proprietary machines;
- R&D is based on global collaboration;
- Open Source - build it yourself;
- Right to repair guaranteed;
-

4.5 Pricing Plans

Product Lines	Units	Sales Price Per Unit	COGS Per Unit	Margin Per Unit
CEB Press	Presses	P99,547	P72,000	P27,547
Tractor	Tractors	P163,094	P108,000	P55,094
Power Cube	Cubes	P28,174	P14,400	P13,774

4.6 Competitors Offering

	Machine	Prototype : Materials + Labour	Prototype: Materials + Labour Inflation Adjusted by 150%	Prototype: Materials Only	Prototype: Materials Only - Inflation adjusted by 150%	Retail Model	Retail Price	Price Difference	Savings - Labour + Materials	Savings - Materials Only
1	CEB Press	\$5,530.40	\$8,295.60	\$4,000.00	\$6,000.00	Powell & Sons PGA-360-12	\$49,700.00	\$41,404.40	83.31%	92.38%
2	Tractor	\$9,060.80	\$13,591.20	\$6,000.00	\$9,000.00	John Deere 5075M Utility Tractor	\$44,487.00	\$30,895.80	69.45%	86.51%
3	Power Cube	\$1,565.20	\$2,347.80	\$800.00	\$1,200.00	Greenlee Hydraulic Power Unit 13hp	\$7,305.90	\$4,958.10	67.86%	87.24%

4.7 Competitive Assessment

Open Source Hardware remains cheaper, built to last a life-time and comes without any proprietary restrictions to repair and maintain equipment.

5 Profiles of Target Markets

5.1 General Background

OSEB Microfactory will begin by offering a CEB press and tractor as well as the power cubes to operate those machines. The CEB press offers a solution to provide low cost sustainable housing with the tractor supporting the building construction industry as well as agricultural enterprises

According to the World Bank there are around five tractors for every 1,000 farmers in Africa as compared to 1,600 tractors for every 1,000 farmers in the U.S. OSEB intends to redress this imbalance.

5.2 Sizes, Segments and Trends

5.3 Review of Competition

5.4 Customers/Users

5.5 Medium-term Projections

5.6 Review of Market Potential

6 Marketing Strategies, Sales Plans & Projections

6.1 Key Marketing Strategies

- Promotion at trade shows and agricultural shows
- Promotion through music competitions and at music shows
- Demonstrations at government and private technical and agriculture institutions

6.2 Sales Forecasts

Product Lines	Year 1 Totals	Year 2 Totals	Year 3 Totals
CEB Press			
Presses Sold	66	120	132
Total Sales	P6,570,102	P11,945,640	P13,140,204
Total COGS	P4,752,000	P8,640,000	P9,504,000
Total Margin	P1,818,102	P3,305,640	P3,636,204
Tractor			
Tractors Sold	15	36	40
Total Sales	P2,446,410	P5,871,384	P6,458,522
Total COGS	P1,620,000	P3,888,000	P4,276,800
Margin	P826,410	P1,983,384	P2,181,722
Power Cube			
Cubes Sold	81	156	172
Total Sales	P2,282,094	P4,395,144	P4,834,658
Total COGS	P1,166,400	P2,246,400	P2,471,040
Margin	P1,115,694	P2,148,744	P2,363,618
Total Units Sold	162	312	343
Total Sales	P11,298,606	P22,212,168	P24,433,385
Total Cost of Goods Sold	P7,538,400	P14,774,400	P16,251,840
Total Margin	P3,760,206	P7,437,768	P8,181,545

7 Technology and R&D

7.1 Overview of Technology

Open source hardware technology as denoted in GVCS.

7.2 R&D Plans

R&D is done collaboratively with inputs from global collaborators affiliated with OSE

8 Operational Plans

8.1 Locations & Facilities

Location: Mantshadidi near Palapye. 128ha available consisting of 8 family plots 16 ha each.

8.2 Operating Methods/Procedures

OSEB Microfactory doubles as a manufacturing facility for the GVCS machines as well as a teaching and learning space to create master fabricators who can go on to further develop the GVCS machines or start their own enterprises.

8.3 Capital Expenditure Projections/Startup Costs

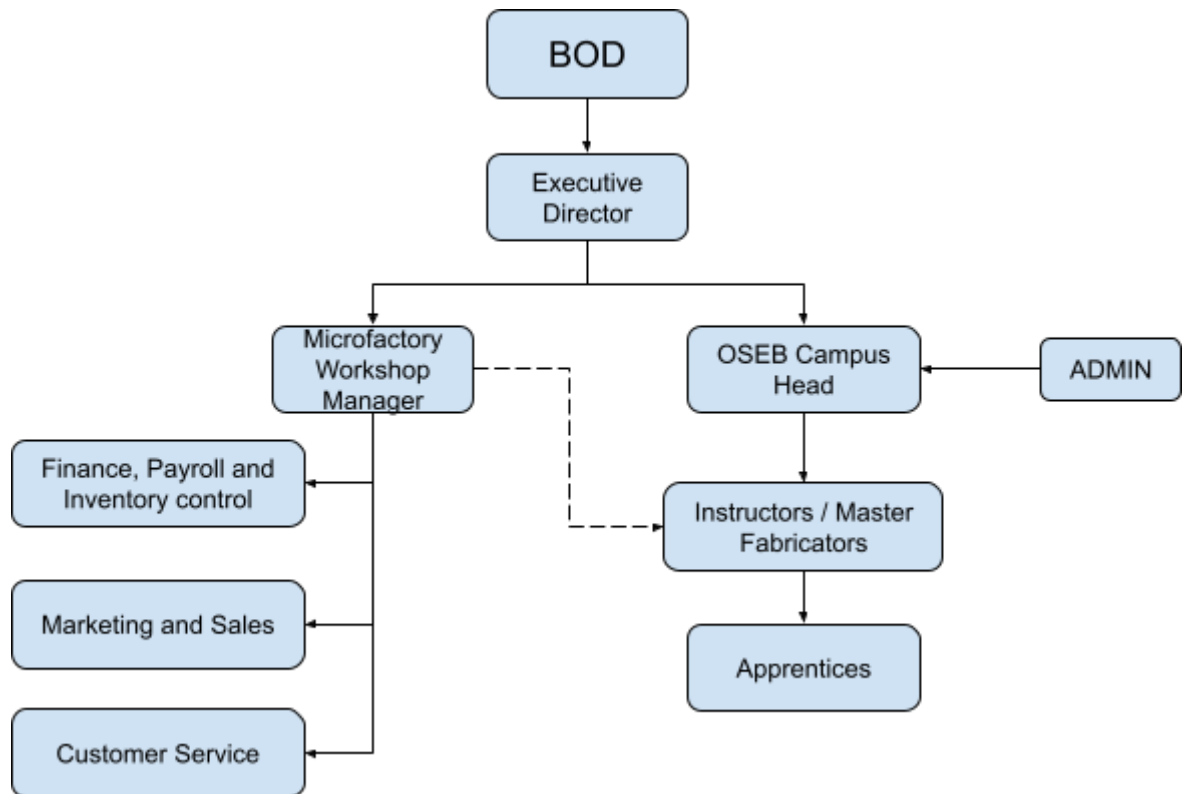
	ITEM	BWP	USD
1	Borehole + pump +equipment	300,000	25,000
2	Generator (diesel powered 150KVA)	60,000	5,000
3	Workshop foundation (Universal Prototyping Structure)	60,000	5,000
4	Roof PV + inverters 50KW \$50K + Batteries \$20K	917,650	76,471
5	Microfactory Equipment	928,800	77,400
6	Inventory to build 2 each of CEB Press, Power Cubes, Tractor +PTO+loader	388,800	32,400
7	Labour: 1 x Executive Director 12 months @ P30K/month	360,000	30,000
8	Labour: 14 x Apprentices/entrepreneurs 12 months @ 3K/month	504,000	42,000
9	Consultancy & R&D - MJ \$10K/month for 3 months +\$5K air ticket MCI/GBE/MCI	420,000	35,000
10	Construction of 5 toilets+septic tank + 5 showers (estimate)	50,000	4,167
11	Construction of outdoor kitchen structure	10,000	833
12	Operating Licences / Manufacturing Business Licences + Co. reg	750	63
13	Van + Minibus	100,000	8,333
	Total	4,000,000	333,333

8.4 Operating Cost Projections

Line Item	First Year	Growth Rate 1 to 2	Second Year	Growth Rate 2 to 3	Third Year
Advertising	P12,000	3%	P12,360	3%	P12,731
Car and Truck Expenses	P6,000	3%	P6,180	3%	P6,365
Insurance (other than health)	P12,000	3%	P12,360	3%	P12,731
Licenses	P250	5%	P263	5%	P276
Rent or Lease -- Vehicles, Machinery, Equipment	P5,000	3%	P5,150	3%	P5,305
Utilities	P0	3%	P0	3%	P0
Miscellaneous (Internet services)	P18,000	3%	P18,540	3%	P19,096
Total Expenses	P53,250		P54,853		P56,503
Other Expenses					
Depreciation	P262,568		P262,568		P262,568
Commercial Loan	P294,912		P283,262		P270,709
Line of Credit	P45,308		P56,173		P56,173
Total Other Expenses	P602,789		P602,004		P589,450
Total Operating Expenses	P656,039		P656,856		P645,954

9 Management & Administration

9.1 Management Structure



9.2 Key Management Profiles

9.2.1 Executive Director x 1

9.2.2 Microfactory Workshop manager & Head of OSEB Campus x1

Initially the Microfactory Workshop Manager will double as OSEB Campus Head. Salary P30K/month

9.3 Administration and Systems

9.3.1 Instructor/Master Fabricator x 2

Salary P15K/month

9.3.2 Finance, Payroll and Inventory Controller x 1

Part time position, to begin with, 20 hours per week @ P3K/month

9.3.3 OSEB Campus Administrator x 1

Part time position, to begin with, 20 hours per week @ P3K/month

9.4 Headcount Projections

TBA

10 Financial Projections

10.1 Key Assumptions

- Full funding of P4 million loan received from CEDA;
- Loan repayment to start at end of 1st year in operations;
- Training and production with MJ to start in Month 3 with first sales in Month 4;
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10.2 Income P&L Projections

Revenue	First Year		Second Year		Third Year	
CEB Press	P6,570,102		P11,945,640		P13,140,204	
Tractor	P2,446,410		P5,871,384		P6,458,522	
Power Cube	P2,282,094		P4,395,144		P4,834,658	
Total Revenue	P11,298,606	100%	P22,212,168	100%	P24,433,385	100%
Cost of Goods Sold						
CEB Press	P4,752,000		P8,640,000		P9,504,000	
Tractor	P1,620,000		P3,888,000		P4,276,800	
Power Cube	P1,166,400		P2,246,400		P2,471,040	
Total Cost of Goods Sold	P7,538,400	67%	P14,774,400	67%	P16,251,840	67%
Gross Margin	P3,760,206	33%	P7,437,768	33%	P8,181,545	33%
Payroll	P2,209,229		P2,522,075		P3,161,895	
Operating Expenses						
Advertising	P12,000		P12,360		P12,731	
Car and Truck Expenses	P6,000		P6,180		P6,365	
Insurance (other than health)	P12,000		P12,360		P12,731	
Licences	P250		P263		P276	
Rent or Lease -- Vehicles, Machinery, Equipment	P5,000		P5,150		P5,305	
Miscellaneous (Internet services)	P18,000		P18,540		P19,096	
Other Expense 1						
Other Expense 2						
Total Operating Expenses	P53,250	0%	P54,853	0%	P56,503	0%
Income (Before Other Expenses)	P1,497,727	13%	P4,860,841	22%	P4,963,146	20%
Other Expenses						
Amortised Start-up Expenses	P428,250		P428,250		P428,250	
Depreciation	P262,568		P262,568		P262,568	
Commercial Loan	P294,912		P283,262		P270,709	
Line of Credit	P45,308		P56,173		P56,173	
Total Other Expenses	P1,031,039	9%	P1,030,254	5%	P1,017,700	4%
Net Income Before Income Tax	P466,688		P3,830,587		P3,945,446	
Income Tax	P178,988		P851,767		P874,739	
Net Income/Loss	P287,701	3%	P2,978,820	13%	P3,070,707	13%

10.3 Cash Flow Projections - Summary

	Year 1 Totals	Year 2 Totals	Year 3 Totals
Beginning Balance			
Cash Inflows			
Cash Sales	P5,649,303	P11,106,084	P12,216,692
Accounts Receivable	P4,819,430	P11,010,450	P12,124,142
Total Cash Inflows	P10,468,733	P22,116,534	P24,340,834
Cash Outflows			
Investing Activities			
New Fixed Asset Purchases	P0	P0	P0
Additional Inventory	P0	P0	P0
Cost of Goods Sold	P6,429,600	P14,652,000	P16,128,720
Operating Activities			
Operating Expenses	P53,250	P54,853	P56,503
Payroll	P2,209,229	P2,522,075	P3,161,895
Taxes	P178,988		P874,739
Financing Activities			
Loan Payments	P444,966	P444,966	P444,966
Owners Distribution	P0	P0	P0
Line of Credit Interest	P45,308	P56,173	P56,173
Line of Credit Repayments	P0	P0	P0
Dividends Paid	P0	P0	
Total Cash Outflows	P9,361,341	P17,730,066	P20,722,997
Net Cash Flows	P1,107,392	P4,386,468	P3,617,837
Operating Cash Balance			
Line of Credit Drawdown	P702,164	P0	P0
Ending Cash Balance			
Line of Credit Balance			

Detailed cash flow at [📄 Microfactoryprojections5FEB22](#)

10.4 Balance Sheet Projections

ASSETS	First Year	Second Year	Third Year
Current Assets			
Cash	1,809,556	5,344,256	8,962,094
Accounts Receivable	829,873	925,507	1,018,058
Inventory	388,800	388,800	388,800
Prepaid Expenses	856,167	428,083	0
Other Initial Costs	333	167	0
Total Current Assets	\$ 3,884,729	\$ 7,086,813	\$ 10,368,951
Fixed Assets			
Real Estate -- Land	960,000	960,000	960,000
Real Estate -- Buildings	997,650	997,650	997,650
Leasehold Improvements	-	-	-
Equipment	928,800	928,800	928,800
Furniture and Fixtures	-	-	-
Vehicles	100,000	100,000	100,000
Other	300,000	300,000	300,000
Total Fixed Assets	\$ 3,286,450	\$ 3,286,450	\$ 3,286,450
(Less Accumulated Depreciation)	\$ 262,568	\$ 525,136	\$ 787,705
Total Assets	\$ 6,908,611	\$ 9,848,127	\$ 12,867,696
LIABILITIES & EQUITY			
Liabilities			
Accounts Payable	1,108,800	1,231,200	1,354,320
Commercial Loan Balance	3,849,946	3,688,242	3,513,985
Commercial Mortgage Balance	-	-	-
Credit Card Debt Balance	-	-	-
Vehicle Loans Balance	-	-	-
Other Bank Debt Balance	-	-	-
Line of Credit Balance	702,164	702,164	702,164
Total Liabilities	\$ 5,660,910	\$ 5,621,607	\$ 5,570,470
Equity			
Common Stock	960,000	960,000	960,000
Retained Earnings	287,701	3,266,520	6,337,227
Dividends Dispersed/Owners Draw	-	-	-
Total Equity	\$ 1,247,701	\$ 4,226,520	\$ 7,297,227
Total Liabilities and Equity	\$ 6,908,611	\$ 9,848,127	\$ 12,867,696
Balance sheet in or out of balance?	\$ -	\$ -	\$ -
	Balanced!	Balanced!	Balanced!

10.5 Ratio Analyses

Ratios	Year One	Year Two	Year Three	Industry Norms	Notes
Liquidity					
Current Ratio	0.7	1.3	1.9	2.1	An indication of a company's ability to meet short-term debt obligations.
Quick Ratio	0.5	1.1	1.8	1.4	The ratio between all assets quickly convertible into cash and current liabilities. Measures a company's liquidity. Also called acid-test ratio.
Safety					
Debt to Equity Ratio	4.5	1.3	0.8	1.0	This ratio expresses the relationship between capital contributed by creditors and that contributed by owners.
Debt-Service Coverage Ratio - DSCR	0.1	0.6	0.6	1.3	This ratio indicates how well your cash flow covers debt and the capability of the business to take on additional debt.
Profitability					
Sales Growth	0.0%	96.6%	10.0%		
COGS to Sales	66.7%	66.5%	66.5%		
Gross Profit Margin	33.3%	33.5%	33.5%	32.8%	
SG&A to Sales	20.0%	11.6%	13.2%		
Net Profit Margin	2.5%	13.4%	12.6%	1.6%	
Return on Equity (ROE)	23.1%	70.5%	42.1%	0.6%	
Return on Assets	4.2%	30.2%	23.9%	0.6%	
Owner's Compensation to Sales	3.2%	1.9%	2.3%		
Efficiency					
Days in Receivables	26.4	15.0	15.0		
Accounts Receivable Turnover	13.6	24.0	24.0	67.0	
Days in Inventory	18.6	9.6	8.7		
Inventory Turnover	19.4	38.0	41.8	96.0	
Sales to Total Assets	1.6	2.3	1.9		

 Microfactoryprojections5FEB22

10.6 Break-Even Analysis Year 1

Gross Margin % of Sales	
Gross Margin	P3,760,206
Total Sales	P11,298,606
Gross Margin/Total Sales	33.3%
Total Fixed Expenses	
Payroll	P2,209,229
Operating Expenses	P656,039
Operating + Payroll	P2,865,268
Breakeven Sales in Pula (Annual)	
Gross Margin % of Sales	33.3%
Total Fixed Expenses	P2,865,268
Yearly Break Even Amount	P8,609,510
Monthly Break Even Amount	P717,459

10.7 Overall Assessment

General Financing Assumptions	Value	Findings
Owner's Cash Injection into the Business	19.4%	Owner's injection might be too low in relation to the amount of money needed
Cash Request as percent of Total Required Funds	0.0%	Cash request seems reasonable with respect to total request
Loan Assumptions	Value	Findings
Commercial Loan Interest rate	7.5%	Interest rate seems reasonable
Commercial Loan Term in Months	180	Loan term may be too high for this type of loan
Commercial Mortgage Interest rate	9.0%	Interest rate seems reasonable
Commercial Mortgage Term in Months	240	Loan term seems within range for this type of loan
Debt-Service Coverage	9.7%	Calculated loan payments relative to operating profit seem reasonable
Income Statement	Value	Findings
Gross Margin as a Percent of Sales	33.3%	Gross margin percentage seems reasonable
Owner's Compensation Lower Limit Check	P360,000	An owner's compensation amount has been established
Owner's Compensation Upper Limit Check	125.1%	Owner's compensation may be too high relative to profitability of business
Advertising Expense Levels as a Percent of Sales	0.1%	Advertising as a percent of sales may be too low
Profitability Levels	P287,701	The business is showing a profit
Profitability as a Percent of Sales	2.5%	The projection does not seem highly unreasonable
Cash Flow Statement	Value	Findings
Desired Operating cash Flow Levels	P702,164	The financial projection provides the desired level of cash flow
Line of Credit Drawdowns	P702,164	The business will need at least this level of a line of credit
Accounts Receivable Ratio to Sales	7.3%	Accounts receivable amount as a percent of sales seems reasonable
Balance Sheet	Value	Findings
Does the Year 1 Balance Sheet Balance?	P0	The balance sheet does balance
Debt to Equity Ratio	453.7%	Debt heavy
Breakeven Analysis	Value	Findings
Do Sales Exceed the Breakeven Level?	P2,689,096	The sales projection exceeds the projected break-even sales level

11 Funding

11.1 Funding Requirements

This business plan is based on a funding requirement of P4 million (US\$333,333).

11.2 Funding Proposals

Proposal for funding is to apply for CEDA Manufacturing loan up to the maximum P4 million loan amount using this business plan for the application..

12 Implementation

12.1 First Year

	Month 0	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Key Task 1	CEDA Funding Application and Funding Acquisition												
Key Task 2	Assemble Mgmt Team												
Key Task 3	Assemble Instructor/Master Fabricators												
Key Task 4		Borehole Drilling and equipping											
Key Task 5		Buy 150KVA Diesel Genset											
Key Task 6		Clearing plot & digging foundation trenches											
Key Task 7		Septic tank construction											
Key Task 8		Toilets and showers construction											
Key Task 9		Microfactory workshop foundation, rebar pillars & roof											
Key Task 10		Order Microfactory Equipment											
Key Task 11		Order Inventory											
Key Task 12				MJ on-site. Begin first builds - CEB Press, Tractors & Power Cubes									
Key Task 13	Apprentice recruitment												
Key Task 14		Marketing and Pre-sales of machines - Acquiring Pre-orders											
Key Task 15		On-going infrastructure development and building from 1st CEB Press making bricks used to build housing, dormitories, kitchen and dining facilities etc.											

12.2 Subsequent Years

Spin-off businesses leveraging open source machines produced in the Microfactory will be developed, both to dog food our products to improve designs as well as for cross-subsidised funding.

- Construction Business using CEBs;
- Agriculture Businesses including:
 - Aquaponics;
 - Hydroponics;
 - Conventional farming;
 - Animal husbandry;
 - Bee keeping
- OSEB Campus providing apprentice training as well as running short workshops
- 3D Printer manufacture, sales and 3D printing services provision

12.3 Contingency Plans

To mitigate unforeseen circumstances that may include undershooting of sales forecasts, delays in GVCS machines further R&D and development, delays in acquiring inventory or major price increases, the following strategies will be implemented:

- Spin-off businesses to provide additional funding
- Additional funding sources such as African Development Bank and Digital Bank of Africa (DafriBank)
- Fundraising and promotion events to be hosted e.g. Music Concerts to raise funding as well as spread awareness and raise interest in OSEB.

13 Conclusion

Botswana's Vision 2036 envisions prosperity for all Batswana by 2036. Taking this lofty and noble vision further OSEB envisions prosperity for all Africans through the design, development, build and use of the 50 GVCS machines. The Global Village Construction Set startup kit is means by which Botswana and the rest of Africa can achieve manufacturing industries on a small and independent level forming networks of distributed enterprises throughout Africa that produce commercially viable, high quality products at a fraction of the cost of equivalent proprietary products. Products that last a life-time, products that are repairable and maintainable and free economies from the stranglehold of monopolistic multinational corporations whose primary goal is profit driven at the expense of the development of the indigenous peoples of Africa.

All the resources required to develop Africa are available in Africa. Recently Botswana celebrated diversifying her economy away from heavy reliance on the sale of diamonds by the sale of 50,000 tons per month of iron ore to China. Imagine if that iron ore was processed in Botswana and the resulting steel used to produce the very machines that China produces and sells back to Africa.

The microfactory enterprise is a small scale manufacturing enterprise that SMEs could take up to provide sustainable livelihoods for themselves as well as providing valuable products and services in the communities in which they operate. The Microfactory then becomes a catalyst for an explosion of other businesses that take off using the GVCS open source machines.

In Conclusion OSEB intends to be the driving force behind the open source hardware revolution in Africa. Creating opportunities for the creation of sustainable, open and socially responsible enterprises to abolish artificial scarcity created by the current economic outlook and replace it with a world of collaborative design for a transparent and inclusive economy of abundance and prosperity for all.

OSEB Agricultural Business Plan