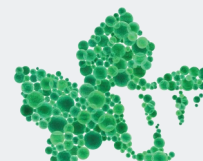




EZA Two-in-One

THE TEAM MEMBERS



WEGE PRIZE



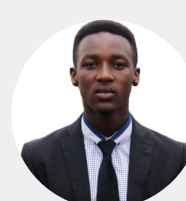
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PART 1 - SOLUTION SUMMARY

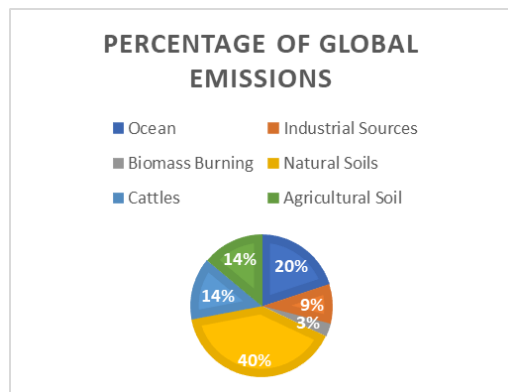
Green promoters group aims at reducing the effects of the chemical fertilizers and pesticides by producing a new blend of organic pesticide and fertilizer. This product can be used as a pesticide and fertilizer at the same time. It is environmentally-safe and affordable. We want to benefit from the wastes and idle resources in our community for making our product. Introduction of EZA Two-in-One will reduce the cost spent on imported pesticides and fertilizers to promote safe agricultural production.

PART 2 - CONTEXT

Chemical pesticides and fertilizers are dangerous to the farmers, consumers and environment. At global scale, they are also leading to critical and long-term health impacts. There are about 385 million cases of acute poisonings annually with approximately 11,000 deaths (UN environment program, 2020). This means that 44% of the global population working on the farms are poisoned every year. This is a serious issue especially in Rwanda where 70% of the population depends on agriculture (FAO, 2021). Most farmers are not skilled about proper use of agrochemical inputs in their farming activities. They lack protective equipment to use in farming activities, this increases contamination risks, and has led to extreme environmental degradation, human and animals' health hazards.

Green Promoters came up with the initiative of making a combination of organic fertilizer and pesticide from a mixture of 8 materials composed of invasive plants and organic wastes found in our community. The EZA Two-in-One production idea is based on use of natural resources such as target minuta, euphorbia tirucalli, lantana camara, chill wastes and some amounts of garlic and tobacco with essential ingredients that act as pesticide. In addition, chicken dung and cow urine wastes contribute nutrient elements in our product. This new blend liquid product serves as the best and effective pesticide and fertilizer for sustainable farming compared to the usual chemical pesticides and fertilizers.

Future rising problems



Source: Adapted from FAO(2019)

About 40% of global emissions result from natural soil disruption and by 2030, it is projected to increase to 50% (FAO,2019). Leaching of nutrients from both livestock and crop farms contribute to pollutants in water, air, and land.

Eventually, soil destruction will lead to an increase in climate change and greenhouse gas emissions. Such natural soil destructions will impact farming and leads to the agricultural intensification raise and more use of agrochemical input rate.

Approach Solutions

It is promising that through the production of EZA Two-in-One, we are going to minimize negative impacts from using chemical pesticides and fertilizers which will enhance safe production.

EZA Two-in-One product will serve two purposes as pesticide and fertilizer and it will contribute to:

- Reduction of chemical inputs usage
- Promotion of safe agricultural production
- Provision of affordable inputs to farmers
- Supporting a go-green environment
- proper waste management and nutrients recycling.

Scope & Location

Our project will be based in Bugesera District in Rwanda. We have chosen to start our project in this location with developed infrastructure and raw materials availability. Bugesera District is the best strategic place of operation where many invasive plants are found from the studies and farming is developing compared to other places which will give us access to high amount of organic wastes.

Moreover, there are many farming activities in Bugesera in addition to the same homeplace of Rwanda Institute for Conservation Agriculture. In the long run, we will expand our operation to large scale farming in Rwanda and sell our product to the local and global markets.



Picture: Lantana Camara Invasive bush at Bugesera District

PART 3: SOLUTION OVERVIEW

Solution Design

Fertilizers and Pesticides are the essential elements for high yield production in agriculture systems in addition to the other micronutrients and sunlight. Having chemical pesticides and fertilizers in Rwanda that jeopardize the natural environment, we decided to think of how to come up with a different approach that will help farmers and sustain the environment. As Green Promoters, we decided to produce our own new mix of pesticide and organic fertilizer namely EZA Two-in-One.

We have exploited the use of idle resources from local industries, livestock wastes, and invasive species plants to develop our product. Some of the raw materials are shown below.



Photos: Tagetes minuta, Tobacco, and euphorbia



Photos: Crushed plants and liquid extracted solutions

Customer Validation

The EZA Two-in-One pesticide fertilizer serves as one of the best alternative for agrochemical inputs. We tested samples with farmers and agricultural agencies and we have received positive feedback from the farm where we used our product. Moreover, as mentioned above 70% of Rwandan population are farmers, and they are developing awareness of the dangers from the use of synthetic fertilizers and pesticides to their farming. Therefore, having organic pesticide fertilizer will serve as better alternative for inorganic inputs to enhance safe production.

Currently, the farmers get both chemical fertilizers and pesticides through Rwanda Agriculture Board (RAB). We will also cooperate with RAB to provide our products to farmers. In addition, all product users will benefit from use of our product due to its effective cost and production by applying a combined fertilizer and pesticide product.

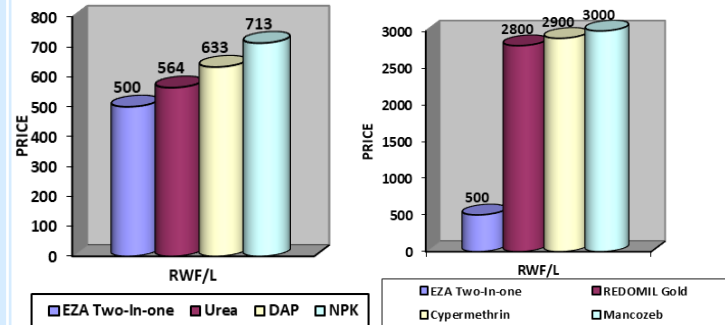
Incentive

Most of the agricultural area in Rwanda are lowlands near watersheds that contain fish farming. Synthetic pesticides and fertilizers have caused many dangers to environment and ecosystem. For instance, the fish farmers at Muhazi lake faced a big loss in recent years due to excess runoff of nutrients from nearby farms (REMA, 2019).



Photo: Fish dies at Muhazi Lake, Eastern Rwanda

Also, most chemical inputs have been reportedly linked with deleterious effects on human health and many negative impacts on the environment. In nature, they contribute to the water, air, and soil pollution. Generally, people are taking actions to mitigate these effects. Due to this farmers are more interested in using organic input. Therefore, the EZA Two-in-One came as a solution due to its affordability, safety and effectiveness.



The graph comparing EZA-Two in One selling price to other fertilizer and pesticides

Economic Feasibility

Many of the materials for our product will be acquired very easily. And the few ones seem to be valuable like tobacco and garlic, will be needed at a very small amount. Moreover, most of the plants we will use regenerate easily since we have two rain seasons in Rwanda. These factors contribute to the affordability of our final product and will enable us to make profit.

From the profit made, we will save some money to reinvest in the business for continuous operation. Moreover, we will create a side income generation from collection of invasive species as a solution to native species destruction. We also have a plan to own a farm and plant some of the plants that we will use which are not invasive species such as garlic, euphorbia tirucalli to reduce the cost charged for payment. We will buy a farm land of 2000 USD in the first year of operation. In addition, we have current saving from our scholarship living allowances of 3000 USD. All these will make our production financially viable and profitable in both short terms and long terms.

Innovation / Circular Economy

The EZA Two-in-One is an innovative and creative project. Therefore, this creative pesticide fertilizer will accelerate the circular economy as most of the materials will be re-used and gain more value.

Other innovation is that the EZA Two-in-One packaging process will reduce the waste of plastic containers in the community. The most producers of these wasted plastic containers in Rwanda are Inyange Industry Limited, Urwibutso Enterprise and SULFO Rwanda Industry Limited. We will use a non-diluted grain alcohol (ethanol) for cleaning those containers because it kills the bacteria on a surface of a plastic and this will not affect our product quality. This new method of packaging will contribute to the plastic wastes management.



Photo: Plastic containers for packaging

Effective flow.

As mentioned above we will use organic farm waste resources and invasive plants that are unused in our community. Most of these plant species are form bushes and when they are cut, their seeds spread and leads to more bushes. We do not expect to run out of production because all the necessary plant required are available at large. Also cutting these selected unused species will not pose any danger to the environment because of the good climate in Rwanda, they will rapidly regenerates.

Moreover, chili farming production in Rwanda is at dramatic increase. The chili industries growth will allow us to access to more chili wastes and as the production increase, we will get more leftovers from industries in production of Eza Two-in-One. The chicken dung and cow urine are also mostly taken as wastes and rarely used efficiently as manure. In general, we expect to have smooth production as all materials are expected to be found locally.

PART 4- IMPACT ASSESSMENT

Green Promoters want to take advantage of some invasive plants, farm and agro-processing waste in Rwanda as mentioned to produce environment friendly product. From the prototype, we found that the mixture of Invasive species repel and kills pests. Also cow urine and chicken dung have essential nutrient such as Nitrogen, Potassium and Phosphorus (NPK) which make them the essential elements in fertilizer.

We understood the framework of the circular economy as a way we can use to eliminate waste by improving or changing how goods and services are designed, manufactured, and used. It is in this case we thought of what we can do as future leaders to reduce the effects of chemical inputs by producing organic pesticide fertilizer for the safety and food security of our communities.



Photo: Lab experiment quality analysis

Economic, Social and Environmental outcomes

Economic outcomes

- Eza Two-in-One contributes to circular economy by using waste and idle resources.
- It will reduce chemical pesticides and fertilizers imports and increase the Gross Domestic Products of Rwanda.
- It will also increases government revenues and create income to people.

Social outcomes

- Contribute to food security and safety.

- Developing a health-conscious community.
- Jobs creation and farmers extension services.
- Well-being and poverty reduction.

Environmental Outcomes

- Eza Two-in-One pesticide fertilizer will contribute to clean and green environment to reduce climate change effects.
- Supporting proper waste management.

PART 5 – PROTOTYPING

We conducted a test of EZA Two-in-One pesticide fertilizer on maize, tomatoes and mangoes as part of research on the effectiveness of the product. We have found that EZA Two-in-One increases good health of the leaves and prevents different diseases and pests that likely attack those plants.

Steps of EZA Two-in-One pesticide fertilizer processing



Photo: Collection and preparation of raw materials



Photo: Finished EZA Two-in-One product



Photo: Testing EZA Two-in-One on crops.

EZA Two-in-One was effective at both killing and repelling armyworms, thrips, fruit flies, mealybugs, late and early blight which highly affect mentioned crops. EZA Two-in-One did not affect the beneficial organisms as it is made from the natural and decaying materials that do not have any effect on the living organisms.

The results have shown that the plots of tomatoes, maize and mangoes where our product was applied, mentioned pest and diseases were successfully controlled by 100% compared to the control field. As a result the yield increased by 40% compared to the other control plants. Our product is able to kill pests such as fall armyworms, thrips, and also its components are able to act as fertilizer and increase the productivity.

From the test we conducted, we found out that 1 liter of pesticide fertilizer diluted in 10 liters of water can serve on a quarter of hectare farm. The EZA Two-in-One is applied on plant. It doesn't affect the plant since it is diluted with water. Our product also consists of essential nutrients such as Phosphorus, Potassium and Nitrogen among others. It is highly needed for the growth of crops and nutritional content in foods.

After producing the EZA Two-in-One, we compost by product and it is later applied in the field as a best natural and organic manure.

Partners

We have been working with different farmers across the country as well as agricultural agencies and enterprises. We tried this product on different crops in farmers' fields and an agricultural institute called Mustard Seed Institute/MSI. The results showed that the product is effective on different crops as pests control and fertilizer. Through different trials we were able to learn more on the raw materials we can use to make EZA Two-in-One and to make choices on which ones we need to include in the production.



Photo: Mustard Seed Institute/MSI tomato farm used EZA Two-in-One pesticide fertilizer

Learning experience and way forward

From the prototyping process, we have learned a lot about our product. EZA Two-in-One consists of organic matter which are not toxic to human health and contains essential nutrients that boost crop yield. We have also assessed different pesticides used in Rwanda and we found out that most of the pesticides are effective to few pests which leads varying of chemical pesticide application on crops.

The EZA Two-in-One has no effect on human health. We have done research on the current pesticides used in Rwanda and we come to learn that EZA Two-in-One is more effective as it can work on multiple crops due to its great quality with no effects. In Rwanda, the most five commonly reported symptoms the farmers experience after applying synthetic pesticides on plants are runny nose (33%), headache (28%), coughing (25%),

nausea (23%), and skin itching (21%). Moreover, other less common symptoms are stomach ache (2%), heavy sweating (4%) and perceived death of domestic animals after consumption of pesticide treated plants (4%). (MDPI, 2019).

Pesticides and insecticides	Target pest or disease
Dursban 48 EC	armyworm
Rocket 44 EC	Sweet potato butterfly
Cyper	Gennadius in tomatoes
CyperGreen	mealybug
Cypermethrin	Alphis fabae Scopoli
Dudu	euphorbiae Thomas, and Myzus persicae
Dimethoate	Whitefly

Table: Pesticides used by farmers in Rwanda

We are also working on an agreement with government schemes through the agricultural agency (Rwanda Agriculture Board) to get the certificate of standardization and register our project at Rwanda Development Board so that none can copy our idea. And we will start producing for market with effective distribution channel of our products to farmers and market. In addition, we plan carry out laboratory tests and researches at Rwanda Institute for Conservation Agriculture, so that we can produce more samples to distribute to farmers and markets.

PART 6- BARRIER ACKNOWLEDGEMENT

The barriers faced include insufficient capital, lack of advanced technology and materials. By this time, we don't have machinery for operation, we address this challenge by using local materials including mortar and pestle.

We do monthly savings to support our operation activities and expansion, we saved 3000 USD up to now. We plan to apply for loan from a youth support organization called BDF (Business Development Fund). Joining Wege Prize competition is also one of the best ways of raising the capital and to network with other investors to get enough money for implementing our project and reach our goal of contributing to safe and sustainable agriculture.

PART 7: DETAILED MATERIAL ANALYSIS

Materials	Active ingredients	Role	Source/Availability	Circular economy
Chill leftovers	Capsaicin	Pest repellent	Processing industry	Waste reuse
Cow urine	95% water, 2.5% urea, 2.5% minerals, hormones, salt and enzymes	Fertilizer	Livestock's farms	Waste reuse
Chicken dung	NPK ratio 3-2.5-1.5	Fertilizer	Chicken farms	Waste reuse
Lantana Camara and tagetes minuta	Essential oil and Methanol	Fumigant & contact pesticides	Weeds and bushes	Idle resources
Euphorbia tirucalli	Latex white-milky sap	Antifungal, antibacterial	From the farmer	Idle resources
Tobacco	Nicotine	Pesticide	Farm	Value addition
Garlic	C ₆ H ₁₀ S ₂ and C ₆ H ₁₀ S ₃	Pest repellent	Farm	Value addition

PART 8 : DETAILED ECONOMIC ANALYSIS

A. BUSINESS MODEL CANVAS

<p style="text-align: center;"><u>Key partners</u></p> <ul style="list-style-type: none"> • Farmers • REMA, RDB, RAB • Delivery companies • Recyclers 	<p style="text-align: center;"><u>Key Activities</u></p> <ul style="list-style-type: none"> ◇ Teaching farmers best use of our EZATwo-in-One pesticide fertilizer ◇ Making our organic pesticide fertilizer/ production, marketing and advertising ◇ Organizing exhibition and workshop 	<p style="text-align: center;"><u>Customer relationship</u></p> <ul style="list-style-type: none"> • Field presentations on use of our products • Workshops and exhibitions • Field follow ups and farm visits • Markets visits • Workshops and exhibitions • Calling and emailing customers
<p style="text-align: center;"><u>Customer Segment</u></p> <ul style="list-style-type: none"> • Small, medium and big farm owners • Agri-dealers within Rwanda and neighboring countries. • Organic and non-organic crops farmers 	<p style="text-align: center;"><u>Value Proposition</u></p> <ul style="list-style-type: none"> ◇ Affordable and environmentally pesticide and fertilizer ◇ Trainings to the farmers ◇ Timely delivery ◇ Healthy benefits to the customers 	<p style="text-align: center;"><u>Cost structure</u></p> <ul style="list-style-type: none"> • Labor and Transportation • Machines and Building • Packaging • Advertisement • Tax and Electricity • Storage materials • Other expenses
<p style="text-align: center;"><u>Revenue Streams</u></p> <ul style="list-style-type: none"> • Sales of EZA Two-in-One pesticide fertilizer . <p style="text-align: center;"><u>Key Resources</u></p> <ul style="list-style-type: none"> ◇ Processing equipment ◇ Human capital/resource ◇ Organic wastes 	<p style="text-align: center;"><u>Channels</u></p> <ul style="list-style-type: none"> ◇ Social media advertisements ◇ Point of sells will be retailers, wholesalers, direct delivery ◇ Online platforms 	<p style="text-align: center;"><u>Target market flow chart</u></p> <p style="text-align: center;">Green promoters</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">Agro-dealers and customers</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">Farmers</p>

Inflow, outflow and cost structure

TOTAL INVESTMENT= 35,000 USD	YEAR 1			YEAR 2			YEAR 3		
Revenue	Qty	P/U	TOT	Q/T	P/U	TOT	Q/T	P/U	TOT
Pesticide Fertilizer	100,000 L	0.5 \$/L	50,000\$	135,000L	0.5\$/L	65,000\$	165,000L	0.5\$/L	82,500\$
Fixed Cost	Qty	P [\$/U]	TOT/\$	Qty	P [\$/U]	TOT/\$	Qty	P [\$/U]	TOT/\$
Tanks	15	45	675						
Buckets	50	10	500						
Grinding machine	2	1,000	2,000						
Filter machine	3	1,000	2,000						
Mixing machine	3	500	1,500						
Crushing machine	2	1,000	2,000						
Land				1	1,000	1,000	1	1,000	1,000
Warehouse (3yrs)	2	1,200	1,200						
T. Fixed Cost			11,075			1,000			1,000
Variable Cost	Qty	P [\$/U]	TOT[/\$]	Qty	P [\$/U]	TOT[/\$]	Qty	P [\$/U]	TOT[/\$]
Packaging	50,000	0.05	2,500	55,000	0.05	2,750	60,000	0.05	3,000
Chili wastes	2,000 kg	0.5	1,000	3,000kg	0.5	1,500	4,000kg	0.2	2,000
Cow urine	30,000 L	0.2	6,000	40,000L	0.2	8,000	50,000L	0.2/L	10,000
Chicken dungs	8,000 kg	0.3	2,400	10,000kg	0.3	3,000	12,000kg	0.3	3,600
Lantana camara	2,000 kg	0.3	600	3,000kg	0.3	900	4,000kg	0.3	1,200
Tagetes minuta	2,000 kg	0.2	400	3,000kg	0.2	600	4,000kg	0.2	800
Euphorbia tirucalli	1,500 kg	0.5	750	2,500kg	0.5	1,250	3,500kg	0.5	1,750
Tabacum	200 kg	10.0	2,000	250kg	10.0	2,500	300kg	10.0	3,000
Water	40,000 L	0.01	400	50,000L	0.01	500	60,000L	0.01	600
Garlics	300 kg	3.3	990	350kg	3.3	1,155	400kg	3.3	1,320
Grain alcohol	50 L	4.1	205	70 L	4.1	287	70 L	4.1	287
Salaries (workers)	5	240	3,600	5	240	3,600	5	250	3,750
Transportation	2	1,000	2,000	2	1,000	2,000	2	1,000	2,000
Miscellaneous			1,285			2,245			2,980
T. variable cost			24,130			30,246			35,287
Total cost			35,205			31,246			36,287
Gross Profit			14,795			33,754			46,213
Tax			400			450			500
Net profit			14,395			33,304			45,713
ROI			42.1%			108.0%			127.3%
Pay-back-Period	1.6 Yrs								
Break-even-point	75,340L								

B.SWOT ANALYSIS

STRENGTH

- Reliable and secured source of raw materials
- Diverse knowledge and skills of staff.
- Environmentally friendly product
- Packaging which will be refilled

WEAKNESS

- Lack of enough capital
- Lack of machinery and advanced technology materials.

OPPORTUNITIES

- Promotion of organic farming by Rwanda ministry of agriculture and other environmental protection NGOs
- High demand and premium prices for organic products.
- Availability of organic farming funds for youth entrepreneurs
- Promotion of made in Rwanda products

THREATS

- Competition on the market with other organic and inorganic pesticides and fertilizer which have already been on the market.
- High cost standardization certificate and project registration

C. RISK ANALYSIS

- Covid-19 Pandemic is a risk for us as green promoters and it limited us to meet and do demonstrations plot and extension services
- Imitating our ideas which can also affect the market for our products.
- At the beginning due to low production capacity we might have a big demand that we can not satisfy

D. COMPETITIVE ANALYSIS

- Rwanda Bio-solution Ltd, SOPYRWA, companies producing organic fertilizer and pesticides respectively. The EZA Two-in-One will serves two functions
- Wholesalers importing chemical fertilizers (NPK, DAP, etc.) and pesticides (Cyper Green, Rocket 44 EC, etc) whereas EZA Two-in-One is environmentally friendly and also assures the safety of farmers

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