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Financial Feasibility of Organic Fertilizer Production in Jordan

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Abstract: This study was conducted to determine the financial feasibility of organic fertilizers production in Jordan. The aim of a feasibility study is to determine if a business opportunity is possible, practical and viable. A financial feasibility analysis provides decision-makers information as to whether or not they can afford to do the project, as well as successfully operate it once constructed. This study gains its importance from the noticed increase of organic fertilizers production took place in Jordan in the latest few years the soaring cost and the adverse effect of chemical-based fertilizer logically cause this increase in organic fertilizer production. Besides, health conscious consumers have preferred organically-grown products that have pushed demand for organic food. Three important and traditional discounted financial indicators were used in the study, they are the Net Present Value (NPV), the Internal Rate of Return (IRR) and the Benefits to Costs ratio (B/C). Six scenarios concerning the increase of costs and the decrease of returns were used. The results of the study showed that all the indicators for financial feasibility analysis used in the study were positive and accepted. The results also showed that the lower the discount rate the higher both the NPV and B/C ratio. The changes in the discount rate level had no effect on the IRR indicator. This means that the organic fertilizers production in Jordan is financially feasible activity to be adopted. The study results encourage the internal and external investors to invest in this activity in Jordan. Further studies are needed in this area of investigation in Jordan.

Key words: Organic fertilizers, financial feasibility, discount rate, net present value, internal rate of return, benefits to costs ratio

INTRODUCTION

Jordan has recorded increased organic fertilizers production reaching to 25000 metric tons (2008) produced by five major organic fertilizers factories (MOA, 2008). The soaring cost and the adverse effect of chemical-based fertilizer logically cause this increase in organic fertilizer production. Besides, health conscious consumers have preferred organically-grown products that have pushed demand for organic food (Sukhamoy, 1987).

Fertilizer is any material that is added to a soil in order to supply plant nutrients and soil fertility is the related ability of a soil to supply the nutrients essential to plant growth (SSSA, 1996). In order to attain, the equilibrium of nutrient cycles, it is enough to follow a very simple recife: What comes from soil must be returned to the soil (Sequi, 1990). DFID (2002) stated that environmental degradation can compromise with current agricultural productivity, undermine future production and perpetrate poverty. Organic fertilizers have been confirmed to improve the physical properties of soil (Swarup, 1987), the biological status of soil (Chai *et al*., 1988), soil fertility and consequently crop yield (Lal and Mathur, 1989).

The aim of a feasibility study is to determine if a business opportunity is possible, practical and viable. A financial feasibility analysis provides decision-makers information as to whether or not they can afford to do the project, as well as successfully operate it once constructed. The net present value, the internal rate of return and the benefits to costs ratio are three of the most beneficial financial indicators to be used in feasibility studies. The Net Present Value (NPV) is the present value of an investment's future net cash flows minus the initial investment. If positive, the investment should be made (unless an even better investment exists), otherwise it should not (Lin *et al*., 2000). NPV is defined as standard method for the financial appraisal of long-term projects. It measures the excess or shortfall of cash flows, in Present Value (PV) terms, once financing charges are met.

The internal rate of return is useful number to know when you are evaluating an investment. It is often assumed that higher is better for both of the net present value and the internal rate of return. In particular, it is usually stated that investments with higher internal rates of return are more profitable than investments with lower internal rates of return (Baker, 2000). The discount rate

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often used in capital budgeting that makes the net present value of all cash flows from a particular project equal to zero. Generally speaking, the higher a project's internal rate of return, the more desirable it is to undertake the project. As such, IRR can be used to rank several prospective projects a firm is considering. Assuming all other factors are equal among the various projects, the project with the highest IRR would probably be considered the best and undertaken first.

BCA analysis is commonly used to evaluate the economic feasibility of traditional public expenditures (Orth *et al*., 1998). BCA is a process by which business decisions are analyzed (Bent *et al*., 2002). The benefits of a given situation or business related action are summed and then the costs associated with taking that action are subtracted (Boardman *et al*., 2001).

Importance of organic fertilizers: When used in reference to fertilizers, the word organic generally means that the nutrients contained in the product are derived solely from the remains or a by product of an organism. Cottonseed meal, blood meal, fish emulsion, manures and sewage sludge are examples of organic fertilizers. Intensive land use without appropriate soil management practices leads to environmental degradation (Senjobi *et al*., 2000).

Organic fertilizers depend on soil organisms to break them down to release nutrients; therefore, most are effective only when soil is moist and warm enough for the micro-organisms to be active. Nutrient release by microbial activity in general, occurs over a fairly long time period. Manure is a complete fertilizer, but low in the amount of nutrients it supplies. Manures vary in nutrient content according to the animal source and what the animal has been eating. A fertilizer ratio of 1-1-1 (nitrogen, phosphorus and potash) is typical. Commonly available manures include horse, cow, chicken and sheep. The highest nutritional concentration is found in manure when it is fresh. As it is aged, exposed to weather, or composted, nutrient content is reduced. However, most gardeners prefer to use composted forms of manure to ensure lesser amounts of salts, thereby reducing the chance of burning plant roots. Because of its low concentration of plant nutrients, manure is best used as a soil conditioner instead of a fertilizer. Typical rates of manure applications vary from a moderate 70 pounds/1000 feet^2 to as much as 1 ton/1000 feet^2. Compared to synthetic fertilizer formulations, organic fertilizers contain relatively low concentrations of actual nutrients, but they perform important functions, which the synthetic formulations do not. They increase the organic content and consequently the water holding capacity of the soil. They improve the physical structure of the soil, which allows more air to get to plant roots. Where, organic sources are used for fertilizer, bacterial and fungal activity increases in the soil. Mycorrhizal fungi, which make other nutrients more available to plants thrive in soil where, the organic matter content is high. Organically, derived plant nutrients are slow to leach from the soil making them less likely to contribute to water pollution than synthetic fertilizers (Relf, 2001).

Manure organic fertilizer is a good way to increase production year after year without causing any harm to human being as well as to environment. The natural fertilizer is not only the food for plants but also for the beneficial bacteria and other beneficial lives in the soil e.g. 10 g of soil contains 400 lacs of micro-organisms. Ecology plays an important role in production. Ecology means the balance of air, moisture, lives and temperature, etc. in the soil. Now-a-days ecology is in imbalance due to improper use of chemicals and fertilizers. The balance of ecology is also maintained by the use of natural organic fertilizer to maintain biological, chemical and physical characteristics of the soil, essential nutrients in exact measure with scientifically mixing in the soil with natural fertilizer, nutrients like nitrogen, phosphorous, potash, calcium, sulphur as well as micro nutrients like iron, zinc and copper, etc. It makes the soil soft so it increases the strength to contain moisture by many holes of the soft soil. To improve the constitution of soil, which do impartial control of the salt of soil. Also, protects crop from small insects, diseases and termite, etc. Use of natural fertilizer will make the soil, friable and mallow, free from soil born pathogens, pests and insects. Soil porosity increase resulted in increased availability of air containing plenty of oxygen specifically at root zone.

Natural organic fertilizer is an approach, which ensures that plant nutrition be environmentally, socially and economically viable (FAO, 1955).

MATERIALS AND METHODS

Data collection: The secondary data sources to achieve the study objectives include all the five organic fertilizers production factories in Jordan. A questionnaire was constructed to collect the necessary primary data from the five factories as well as other related sources such as the related agricultural companies and nurseries. Socioeconomic related information, total variable costs annual revenues and net income were other included items in the questionnaire; these items were broken down to their corresponding subtitles. The collected data is an

average of the five production factories. Other related data sources include the Department of Statistics, Ministry of Trade and Industry and Ministry of Agriculture.

Data analysis: The total fixed and variable costs as well as the total annual revenues were calculated on yearly basis. Averages of the costs and revenues for the five production factories were calculated to be considered the core of the analysis in the determination of the financial feasibility of the organic fertilizers production in Jordan. The NPV, IRR and the B/C ratio are the financial indicators used in the study.

The financial indicators: The Net Present Value (NPV), it is the present value of an investment's future net cash flows minus the initial investment. Positive NPV represents an indicator to the investment to be made (unless an even better investment exists), otherwise, it should not. Net Present Value (NPV) or Net Present Worth (NPW) is defined as the total Present Value (PV) of a time series of cash flows. It is a standard method for using the time value of money to appraise long-term projects. Used for capital budgeting and widely throughout economics, it measures the excess or shortfall of cash flows, in present value terms, once financing charges are met (Lin *et al*., 2000). Each cash inflow/outflow is discounted back to its Present Value (PV). Then they are summed. Therefore, NPV is the sum of all terms (Eq. 1):

$$\frac{R_t}{(1+i)^t} \quad (1)$$

where,

t = The time of the cash flow
i = The discount rate (the rate of return that could be earned on an investment in the financial markets with similar risk)
R_t = The net cash flow (the amount of cash, inflow minus outflow) at time t (for educational purposes)
R_0 = Commonly placed to the left of the sum to emphasize its role as (minus the) investment

If NPV>0, then the investment would add value to the firm and the project may be accepted. If NPV<0, then the investment would subtract value from the firm and the project should be rejected. If NPV = 0, then the investment would neither gain nor lose value for the firm and we should be indifferent in the decision whether to accept or reject the project.

The Internal Rate of Return (IRR): The Internal Rate of Return (IRR) is a capital budgeting metric used by firms to decide whether they should make investments. It is also, called Discounted Cash Flow Rate of Return (DCFROR) or Rate of Return (ROR). It is an indicator of the efficiency or quality of an investment, as opposed to Net Present Value (NPV), which indicates value or magnitude (Bruce, 2003). IRR is the discount rate that generates a zero net present value for a series of future cash flows. This essentially means that IRR is the rate of return that makes the sum of present value of future cash flows and the final market value of a project (or an investment) equal its current market value. Internal rate of return provides a simple hurdle rate, whereby any project should be avoided if the cost of capital exceeds this rate. Usually, a financial calculator has to be used to calculate this IRR, though, it can also be mathematically calculated using the (Eq. 2):

$$CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \frac{CF_n}{(1+r)^n} = 0 \quad (2)$$

In the Eq. 2, CF is the Cash Flow generated in the specific period (the last period being n). IRR, denoted by r is to be calculated by employing trial and error method. IRR is the flip side of Net Present Value (NPV), where, NPV is the discounted value of a stream of cash flows, generated from an investment. IRR thus, computes the break even rate of return showing the discount rate, below which an investment results in a positive NPV.

The Benefits to Costs ratio (B/C): B/C ratio is the ratio of the total present value of benefits during the service life of the project to the total present value of the costs at the MARR. A project is accepted for investment if B/C ratio is greater than or equal to unity and rejected otherwise. A Benefit-Cost Ratio (BCR) is an indicator, used in the formal discipline of cost-benefit analysis that attempts to summarize the overall value for money of a project or proposal. A BCR is the ratio of the benefits of a project or proposal, expressed in monetary terms, relative to its costs, also expressed in monetary terms. All benefits and costs should be expressed in discounted present values (Ascott, 2006).

The scenarios: Different scenarios about the discount rate, the costs and both the discount rate and the costs were assumed during the analysis process to come up with a comprehensive feasibility analysis regarding the three used indicators. The scenarios were:

- Adoption of 15% as a discount rate
- Adoption of 10% as a discount rate
- Assumption of a cost increase by 10% with 15% discount rate

Table 1: Annual averages of the fixed costs and its relative importance

Item	Cost (JD)	Relative importance of the item cost (%)	Relative importance to the total costs (%)
Land	6000.0	8.130	4.059
Buildings*	7000.0	9.485	4.735
Loader*	6000.0	8.130	4.059
Room*	1000.0	1.355	0.676
Store*	1000.0	1.355	0.676
Miller**	2500.0	3.388	1.691
Transporter (2)**	2000.0	2.710	1.353
Silo*	500.0	0.676	0.338
Registration fees	800.0	1.084	0.541
Elec. generator*	5000.0	6.775	3.382
Electricity board*	700.0	0.949	0.5070
Batteries (2)***	300.0	0.407	0.203
Sewing machine**	450.0	0.610	0.304
Industrial tools*	500.0	0.676	0.338
Trucks*	25000.0	33.875	16.912
Salaries	15000.0	20.325	10.147
Total	73800.0	100.000	49.925

*Ten years durable life; **Five years durable life; ***2 years durable life

Table 2: Annual averages of the variable costs and its relative importance

Item	Cost (JD)	Relative importance of the item cost (%)	Relative importance to the total costs (%)
Raw material	28000	37.8280	18.942
Sacs	9300	12.5640	6.291
Fuel	5000	6.7550	3.382
Transportation	11500	15.5360	7.780
Marketing expenditures	2400	3.2420	1.624
Miscellaneous expenditures	2400	3.2420	1.624
Hospitality expenditures	500	0.6755	0.338
Offices rental	1000	1.3510	0.676
Manufacturing expenditures	5000	6.7550	3.382
Loader maintenance	2000	2.7020	1.352
Licenses	200	0.2702	0.135
Wages	6720	9.0790	4.546
Total	74020	100.0000	50.074

Table 3: Costs, benefits and expected cash flow of the project

	Costs (JD)					Discount rate (%)	
Years	Fixed	Variable	Total	Total returns (JD)	Cash flow (JD)	15	10
1	73800	74020	147820	120000	27820	0.8696	0.9090
2	15000	74020	89020	120000	30980	0.7561	0.8260
3	15300	74020	89320	120000	30680	0.6575	0.7510
4	15000	74020	89020	120000	30980	0.5718	0.6380
5	15300	74020	89320	120000	30680	0.4972	0.6210
6	19950	74020	93970	120000	26030	0.4323	0.5640
7	15300	74020	89320	120000	30680	0.3759	0.5130
8	15000	74020	89020	120000	30980	0.3269	0.4670
9	15300	74020	89320	120000	30680	0.2843	0.4240
10	15000	74020	89020	16000	70980	0.2472	0.3860

- Assumption of a cost increase by 10% with 10% discount rate
- Assumption of a cost increase by 10% and revenues decrease by 10% with 15% discount rate
- Assumption of a cost increase by 10% and revenues decrease by 10% with 10% discount rate

The fixed and variable costs: Table 1 and 2 shows the annual averages of the fixed and variable costs and its relative importance of an organic fertilizers production project based on the data collected from the five fertilizers factories in Jordan.

The fixed costs, variable costs and cash flow: The study assumed that the expected project life is for 10 years. The salvage value of the project at the end of the project life assumed to be 40000 JDs. The revenues based on the assumption that the project will produce 3000 tons of organic fertilizers per year with a selling price to be 40 JDs ton^{-1}. Table 3 shows a summary of costs, benefits and expected cash flow of the project.

RESULTS AND DISCUSSION

Table 4 shows the results of data analysis according to the assumed scenarios. As shown in Table 4, according

Table 4: Financial indicators of the study according to the assumed scenarios

Scenario No.	NPV	IRR (%)	B/C
1	111553.6	110.00	1.220
2	148847.4	110.00	1.250
3	61494.0	51.00	1.110
4	88460.0	51.00	1.130
5	47996.0	43.05	1.087
6	70768.2	43.05	1.107

to the 1st scenario NPV is positive and high. The benefits to costs ratio indicates that the returns will cover the costs and a pure 22% of the returns will be achieved. The IRR will be 110%, which is a good and accepted.

According to the 2nd scenario, NPV is higher than that in the first scenario. The benefits to costs ratio indicates that the returns will cover the costs and a pure 25% of the returns will be achieved, the IRR will be 110%, which is a good and accepted as in the first scenario. This scenario 2 indicates that as the discount rate decreases the NPV and the B/C ratio increases. The IRR remains constant.

According to the 3rd scenario, NPV indicator still positive despite the increase in the costs. The benefits to costs ratio indicates that the returns will cover the costs and a pure 11% of the returns will be achieved. The IRR in this scenario decreased to 51% but still good and acceptable.

According to the 4th scenario, NPV indicator increased compared to that in the third scenario and still positive despite the increase in the costs by 10%. The benefits to costs ratio indicates that the returns will cover the costs and a pure 13% of the returns will be achieved. The IRR in this scenario is the same as in the previous scenario 3.

According to the 5th scenario, NPV indicator decreased compared to that in the third and fourth scenarios and still positive despite the increase in the costs by 10% and the decrease of the returns by 10%. The benefits to costs ratio indicates that the returns will cover the costs and a pure 0.087% of the returns will be achieved. The IRR in this scenario decreased compared to the previous scenarios 3 + 4.

According to the 6th scenario, NPV indicator increased compared to that in the fifth scenario and still positive despite the increase in the costs by 10% and the decrease of the returns by 10%. The benefits to costs ratio indicates that the returns will cover the costs and a pure 0.107% of the returns will be achieved. The IRR in this scenario is the same as in the previous scenario 5. This scenario 6 as in the 2nd scenario indicates that as the discount rate decreases the NPV and the B/C ratio increases, the IRR remains constant.

CONCLUSION

The study investigated the financial feasibility of organic fertilizers production in Jordan. Three important and traditional discounted financial indicators were used in the study, they are the Net Present Value (NPV), the Internal Rate of Return (IRR) and the Benefits to Costs ratio (B/C). Six scenarios were used concerning the discount rate value, the increase of costs and the decrease of returns. The results showed that the organic fertilizers production in Jordan is financially feasible activity to be adopted. The results also showed that the lower the discount rate the higher both the NPV and B/C ratio. The changes in the discount rate level are with no effect on the IRR indicator.

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