



UPS 6: Sunflower processing for high quality cooking oil

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KEY OBJECTIVE The main objective of the UPS was to improve the livelihood of farmers by introducing the oil expelling technology to increase the efficiency and benefits accrue to the community through cheaper oil of high quality.

FVC COMPONENT(S): Processing

KEY CONSTRAINTS ADDRESSED

Some of the key constraints in sunflower oil extraction are inefficient oil expelling technology because of lack of standards; Limited R&D on planting materials, diseases and pests pose a serious risk to the industry growth. Land degradation leading to loss of soil fertility and return on investment is on the increase. Packaging industry is yet to be developed and adds significant cost to final price. In terms of marketing, despite its potential, there are no initiatives at national level to support seedcake export market. Financially, the rural sunflower producers have limited outreach (availability) of financial services in the CSS (i.e. Ilolo and Idifu), this include stringent credit terms—security, interest rates and repayment patterns.

DESCRIPTION

Sunflower oil production has great potential in Tanzania because of the availability of the raw material and the growing market for sunflower oil in the country. SMEs that are involved in sunflower oil production have the challenge to increase production of good quality, safe oil for consumers who are becoming more health conscious. Cooking oil has been produced using traditional technologies for millennia in many areas of Tanzania, these processes are often very slow, extract a small percentage of the available oil, and use a considerable amount of energy for heating. Improved extraction technologies can increase oil yields, reduce fuel consumption and enable higher production rates. The success depends on the processors' ability to pay for the improved technology, and having facilities for local maintenance and repair of equipment. It especially depends on the value that can be added to crops by processing, the skills of the processor to make good quality oil, and to manage the enterprise effectively.

Sunflower was mentioned in Trans-Sec UPS as one of the oil crops with high potential for contract farming in the targeted regions. SUA researchers conducted a participatory business plan with farmers group from two villages of Ilolo and Idifu in order to determine the potentiality and profitability of sunflower oil processing business. This exercise was a result of the discussion with actors in field visit to different potential producing area in Dodoma region especially Mvumi ward where most of the farmers (sunflower producers), processors of sunflower oil are.





PROVEN SUCCESS IN TZ AND BEYOND

One reason for encouraging the greater production and processing of sunflower oil in Tanzania is its potential for import substitution, which could generate income and jobs at home and have a beneficial impact on foreign-exchange outflows. Also it is healthier than other types of oil, for example palm oil and groundnut oil. Sunflower oil is low in saturated fat and high in polyunsaturated fat. Oil seed production in Tanzania mainly focuses on groundnuts (40%), sunflower (36%), sesame (15%), cotton (8%) and palm oil (1%). In Zimbabwe, the oil market was dominated by four major producers, based in urban areas but failing to supply rural communities. Given that the oilseeds are grown in the rural areas, and that a market exists there, it made sense to look into decentralised oil production. Small-scale mills are commercially viable, returning an annual average of 51% on typical investments of between US\$ 17,000 - 22,000, with profits of 21% on sales (Fellows and Axtell, 2012).



TRANS-SEC FINDINGS

Some of the selected key findings from this UPS are categorised into economical and technical parts.

ECONOMICAL PART: Procurement based on estimated financial returns is as shown on the table 1.

Table 1: The Benefit cost ratio

COST/YEAR	Year 1	Year 2	Year 3	Year 4
Fixed Capital	7,162,500.000			
Working Capital	4,409,686.608	4,340,874	5,739,560	7,139,847
Operating Costs				
Financing costs	694,995.738	1,093,548	1,320,406	1,594,325
Total Costs	12,267,182.346	5,434,421.662	7,059,966.221	8,734,172.628
Discounting Factor(10%)	0.909	0.826	0.751	0.683
Discounted Costs	11,151,983.951	4,491,257.572	5,304,257.116	5,965,557.426
Sum C	33,495,742.857			
Benefits				
Revenues	14,028,000.000	18,850,125.000	23,672,250.000	28,494,375.000
Discounted Revenues	12,752,727.273	15,578,615.70	17,785,311.80	19,462,041.53
Sum B	85,044,750.000			
Benefits/Costs (B/C) / 4 Years	2.54			
Benefits/Costs (B/C) / Year 1	1.14			

The Sunflower Oil Expeller project is worth (Feasible) to be undertaken since its Benefit-Cost Ratio is 1.14 for Year 1 and 2.54 for four years. Both are greater which is greater than 1 ($BCR \geq 1$) is acceptable. The BCR can increase if the machine serves other farmers from nearby villages.

TECHNICAL PARTS: Sunflower oil is obtained after sunflower seeds have been pressed. Sunflower seeds contain 35-50% oil. Before sunflower seeds have been processed they should be dried well. Sunflower seeds dried inadequately, lead to the possibility of not getting appreciable amount of oil from them. The sunflower seeds which are well dried contain moisture content of 8%. The sunflower pressing machine was procured for Idifu in Chamwino-Dodoma. It has started operating in July 2016.



TYPE OF FOOD CROPS APPLICABLE

The target food crops for this UPS was sunflower in two villages of Ilolo and Idifu in Chamwino district.



TECHNICAL SPECIFICS, DIMENSIONS

The sunflower pressing machine is diesel engine driven. Essentially, the machine has three units which include engine, pressing unit and cooling unit. The specification of the engine is 20 hP with approximately 80 cm length, 65 cm height and 50 cm width. Also it weighs about 200 kg. The pressing unit has an estimated 150 cm length, 120 cm height and 65 cm width. The pressing unit has an approximately 1015 kg. The cooling unit involves the barrel of 200 litres and the cooling medium is water. The whole system has around 1220 kg. The engine and pressing unit are connected through two belts and two pulleys while the cooling unit is connected to the engine through the PVC pipe of approximately 5 cm in diameter. The pictures below show the sunflower pressing machine being tested in Idifu (Figure 1).



Figure 1: Sunflower Pressing machine being tested in Idifu

The performance of the sunflower machine is based on initial data from site and literature. The data include amount of pressed sunflower seeds, estimated amount of diesel used and time. From analysis of these data and the results, it shows that the machine has pressing capacity of 861.90 kg/h (assuming 11.83 kg for 20 l bucket of sunflower seeds), an estimated fuel (diesel) consumption of 18.21 l/h at full load, and sunflower oil production rate of 183 l/h (assuming the ratio of sunflower seeds pressed (kg) to sunflower oil produced (l) to be 4.7:1). Here below is the picture showing the flower, ear, seeds and oil obtained from sunflower plant (Figure 2).

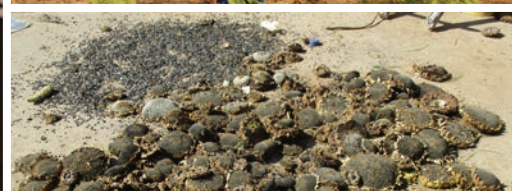


Figure 2 : Sunflowers seeds in the bowl, sunflower oil in a jug, and sunflower ear and flowers

IMPLEMENTATION CONSTRAINTS

There are some constraints impeding the implementation of the UPS which include:

- Group management disputes: This can be handled by putting in place a viable group management guided by their own formulated group constitution.
- Need of fuel and maintenance experts: This can be handled by having the fuel vendors and maintenance experts within the locality.
- Business model requirement: The model should be in place to ensure the viability of the UPS introduced.





LINKAGE TO OTHER FVC COMPONENTS

The UPS is linked to the Natural resources and Crop production. These FVC components have some UPS which contribute to obtain inputs (sunflower seeds) to feed to the UPS in question. Also this UPS is linked to the Marketing and Consumption as it produces the cooking oil and sunflower cakes which can be commercialised and consumed. Furthermore, sunflower oil is a raw material in the production of soap.

CONSIDERATIONS & CRITERIA FOR UPS OUTSCALING

UPS out-scaling potential exists since these farmers in can serve the neighbouring villages. The sustainability of this UPS is possible due its setup as business and have a wider market in Dodoma region and the country as whole. The expansion of the enterprise will results into reaching more neighbouring villages as the demand of the services is high in the region and beyond.

KEY LESSONS LEARNED

- Optimization of mechanical oil extraction should take three elements such as oil production, extraction efficiency and energy requirement into consideration. The optimal process could be either based on maximizing oil production or specific energy input to produce one kg of oil.
- Based on this knowledge, up scaling the capacity of the machine or investigating the machine available in Tanzania using the similar method should be conducted in order to increase the oil yield while simultaneously maintain the oil quality.
- Efficiency sunflower processing can be can be improved in the rural set-ups by introducing mechanised shelling and threshing and hence increase rural livelihoods.

REFERENCES

Fellows, P.J. and Axtell, B. (Eds) (2012). Setting up and running a small-scale cooking oil business, Opportunities in food processing series, ACP-EU Technical Centre for Agricultural and Rural Cooperation (CTA). ISBN 978-92-9081-478-8

Yustas, Y., Romuli, S., Elly, N., Mgeni, C., Munder, S., Makoko, B., Uckert, G., Silayo, V. and Mueller, J. (2016). Testing report on post-harvest processing upgrading strategies: Maize shelling and millet threshing; sunflower processing; optimized market oriented storage. Trans- SEC Deliverable Report D. 6.1.2 (a). <http://project2.zalf.de/trans-sec/public/media/upload/product/pdf/7702f67be69d66d31feb33f4f5f9f263.pdf> (visited on 24/05/2016)

