Challenges in Technology Transfer to Small Scale Operators: The Case of Bixa Farmers of Lamu County

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1. INTRODUCTION

• Bixa Orellana is a shrub that grows 2 -3 metres in height and can be grown from either seed or cutting.
• It matures within 4 – 5 years and has economic life of 20 years
• it produces ponds which, when mature, contain red pigment and, when dried can be used to produce food colourants
• It is the World’s second most important natural colourant (Mercadante and Pfander, 1998) and is the most frequently in the Western world
• It makes about 70 per cent of all world natural dyes
• Peru, brazil and Kenya have recently been the world’s major exporters but the latter’s position is precarious due to the problems the farmers have been facing. United States of America, Japan and European Union Countries (especially Britain and Denmark) are the world’s largest importers
• In Kenya, Bixa Orellana has been one of the four major cash crops in Kwale county and one of the seven major cash crops in Lamu county of the Coast region.
• Kenya Bixa Company, the only one in the country at present, purchases bixa seeds from farmers to produce norbixin for export.
• Local food manufacturers, however, use artificial food colourants, probably due to price and lack of proper policy for promotion of bixa in the domestic market.
• About 85.3 per cent of the local food industries source their food colourants outside Kenya, 62.5 per cent of whom use artificial food colourants (Muhindi, 2006)
This notwithstanding, Bixa extracts have a bright future especially due to recent concerns on health from use of artificial dyes (colourants) in food stuffs since they are safe. This is more so in Kenya where a lot of artificial food colourants are used placing the consumers at health risk.

With proper policies and appropriate technology, Bixa products should be able to turn the tide and enable Kenyan manufacturers to play safe in the market.
Further, potential use arises from versatility in use and diversification of the product to make a range of other products

Value addition is in line with government policy as stipulated in its publications

The National Industrial Policy (2007) states “The broad objective for the policy is increased sectoral value addition and improved competitiveness of the manufacturing sector” (p4)
In Kenya Vision 2030, A Globally Competitive and Prosperous Country (2008), the current driver of development in Kenya, the government states that the socioeconomic transformation of the country will rely on harnessing of technology and innovation in all aspects of the economy (p20).
Enquiries have indicated there is demand for bixa products in the export market but this has been masked with a lot of domestic problems leading to frustration and impoverishment of farmers as well as loss of potential foreign exchange.

A baseline study was funded by the Kenya Government for KIRDI to identify the gaps in processing and marketing of Bixa products in Kenya and abroad.

One of the findings was that there was ready market but the processing technology was expensive: by then costing Ksh 100 – 150 million.
KIRDI took the challenge to find small scale technology which would also be economically viable. Properly disseminated, this would reduce post harvest losses, boost production and employment generally as well as enhance farmers’ incomes.
2. MATERIALS AND PROCESSING METHODOLOGIES

2.1 Commercial Processing Technologies

- Generally, the food colourant is prepared by leaching the outer oily surface of seeds with solvents, vegetable oil fats or alkalized water.

- The extract is a mixture of bixin and norbixin and other soluble materials specific to the solvent used in the extraction.
Bixin is partially oil soluble
Norbixin is completely water soluble
Heat treatment increases the colour of the pigment

2.2 The Process

1) Seeds are soaked in dilute aqueous alkali (e.g. Sodium Hydroxide) for about 10 minutes at a temperature not more than 70 degrees Centigrade
This changes natural bixin to a water soluble salt of norbixin

ii) Extract is run off from the vessel

iii) (i) is repeated to maximize pigment recovery

iv) Extract is filtered and then acidified with dilute mineral acid. This will produce precipitate free norbixin

v) Precipitate is partially de–watered in a filter press thereby producing a weak paste.
Vi) Evaporation of water is done to concentrate the paste for sale

Or

vii) Full dehydration is undertaken to obtain a cake

viii) Milling is done to obtain dried powder for sale

The dehydration and milling aims to create a pigment content of 30 per cent or more.
2.3 The Small Scale Manufacturing Plant

- Aim of project was to scale down the technology to farm gate level
- Equipments are part of technology to convert raw materials into products
- The necessary equipments include stainless steel jacketed vessel with stirrer, two stainless steel tanks for collection and temporary holding, a filter press, thermometer, petri dish and a small mill.
• Installation should allow flow by gravity for ease of operation and minimization of costs of production.

• Extraction was undertaken using Sodium Hydroxide for norbixin and acetone for bixin.

• Recovery was 5.0 per cent by weight at laboratory level and 6.8 per cent at pilot level.

• It was possible to dry norbixin by solar radiation but it was not possible in the case of bixin.
• Bixin, therefore requires artificial drying with electric or solar drier but this could also be recommended for norbixin for hygienic purposes.

3. CHALLENGES OF TRANSFERRING TECHNOLOGY TO SMES

• Promoting growth to small and medium size enterprises (SMEs) has met myriads of problems emanating both from themselves and from other quarters
• Because of SMEs’ limited resources and relative inability to absorb the costs and risks associated with in-house technology development, they must often utilize the process of technology transfer to take advantage of the benefits gained by technology and innovation (Jones and Jain, 2002)

• This project highlights some of the challenges likely to be encountered while trying to operate in the sector.
3.1 Appropriate Technology

- Like in this case of Bixa, most SMEs may find that no technology is available at the level they want to operate or at the level they can afford.

- This could be because the businessman needs to do import substitution for instance or needs to produce a new product. The existing local production could have initially used imported equipments.

- There will, therefore, need for local professional and/or institutions to design and fabricate the machinery and equipment for use by the SME.
3.2 Handling Before, During and After Processing

• Contamination of materials at any level could create risks in the use of products

• Careful handling is critical and could mean survival of the business

• The critical importance of this is that those involved may either be innocent or unaware that their actions put everything in risk

• When we did extraction we were to undertake quality control which is a must for food processing
• The initial products were found to contain cadmium which is a dangerous metal
• It was not clear at what time or in which activity the contamination had occurred
• It was finally found that it was during handling of the raw materials
• Storage after harvesting and the means of transportation are as critical as processing
3.3 Processing Skills

• Except in very few instances, most of the SME operators or would be operators do not have the required skills for the activities they aim to undertake
• At times, they may not have the basic prerequisites for training
• It may, therefore, be necessary for some other people to do critical activities for the SMEs before they learn through participation
• This adds to the costs of the project which must be met

• Where costs of technology may also be relatively high, the SME operator may require help and the role of institutions here need not be overemphasized

3.4 Marketing

• This, together with upgrading of operations, is one of the most problematic issue in promotion of SMEs
• Training to produce quality products can done but getting market for the improved products is also not easy
• While helping the Bixa farmers to add value and enhance their incomes, it became clear that they had little idea how they would market the products
• Training on marketing and joint action in product promotion will be necessary especially because this also requires considerable capital
• Production for existing market requires understanding it and attempting to meet the set standards. This may require considerable inputs on market intelligence as well

• Marketing skills or employing those with them becomes necessary but neither can be achieved by the most SMEs
3.5 Institutional Bottlenecks

• Production for the market and trading calls for certain requirements especially from government agencies and local authorities

• Trade names, trademarks, licences and other prerequisites have to be obtained

• Some of these requirements are complicated not only for SMEs operators but even to average businessmen

• Big companies also look at them to decide in which country to invest
These constraints are well documented and it is not necessary to belabour it here

4.0 CONCLUSION

- It is possible to scale down the Bixin and Norbixin processing technology and produce at cottage level and the same can be transferred to the farmers
- Size individual plant will depend on financial capacity and the market for the products
• Bixa processing is somehow unique due to the potency of the products making it more amenable to small scale processing than is the case with most other crops

• Transferring the technology will face challenges but they are surmountable

SELECTED REFERENCES


Lancashire, R.J. 2005. *Stains, Dyes, Inks and Indicators*. The Department of Chemistry, University of the West Indies, Mona Campus, Kingston 7, Jamaica.


THANK YOU AND GOD BLESS YOU