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Environmental impacts on the design and arts environment for industry 3.0 cotton roller ginning process

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Abstract

The past five decades have been characterised by passage of the environmental impact assessment (EIA) legislation dealing with the environment, including legislation on the control of land, air and water pollution, solid and hazardous waste management, resource conservation and recovery, and soil and ground water and surface water remediation. The aim of this research is to investigate and discuss coronavirus and byssinosis disease impact assessment. Sustainable development is the artistic idea that science and humanities must live and meet their needs without compromising the efficacy and efficiency of future generations to meet their own needs. Prediction and assessment of environmental impacts (effects) on the design and arts environment for industry 3.0 cotton roller ginning process is provided. Sustainable design and arts are discussed in this research work. EIA of conventional design and arts is also investigated. Sustainable design and arts environment for cotton ginning process is presented. The case study and check of strengthening of agricultural extension through sustainable entrepreneurship is discussed in this article.

Keywords: Agriculture, arts, cotton, design, environment, entrepreneurship, ginning, sustainability.

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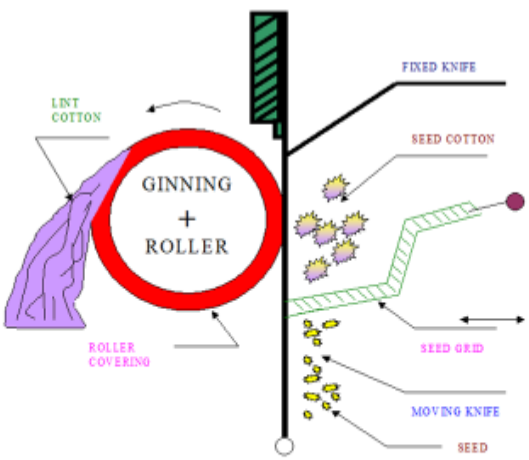
1. Introduction

The 'environmental impact assessment (EIA)' can be defined as the systematic identification and evaluation of the potential impacts (effects) of proposed projects, plans, policies, programmes or legislative actions relative to the physical–chemical, physical–biological, biological–chemical, cultural, anthropological, architectural, archaeological, socioeconomic and surveillance components of the total environment (Vijayan, 2020a) .

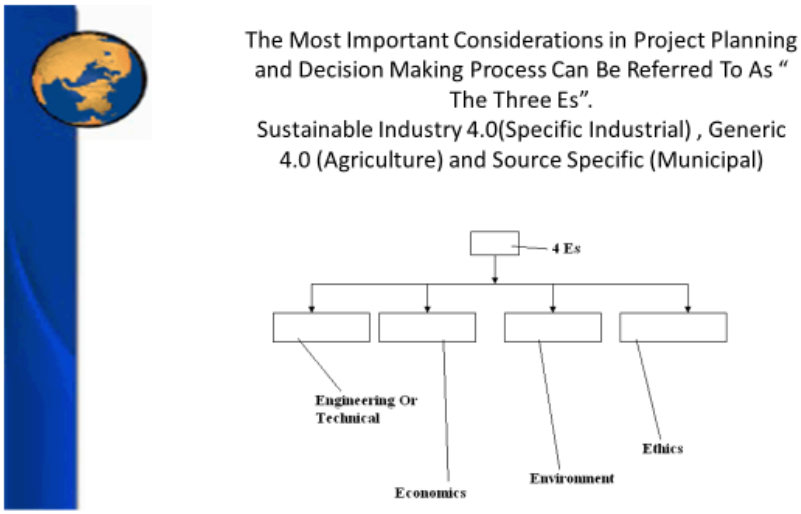
Sustainable entrepreneurship (SE) is a kind of entrepreneurship that meets the needs of the present without compromising the ability, efficiency and values of future generations to meet their own needs (Alonso et al., 2020; Vijayan, 2020b). Agricultural entrepreneurs can be developed through well-conceived and well-directed training programmes around thrust areas, thus advancing the frontiers of theories and practice of SE. The objectives of the study are as follows: (i) to introduce the concept of SE in Ethiopia based on an entrepreneurial research conducted in South India; (ii) to formulate and appraise 43 detailed project reports (DPRs) of diploma in entrepreneurship and business management (DEBM) extension learners in 11 batches attached to the DEBM counsellor and coordinator of the Entrepreneurship Development Institute of India, Ahmedabad (EDI), during the research years (RYs) 2007–2020; and (iii) to promote policy recommendation so as to strengthen agricultural, scientific and technical services focusing on the Ethiopian agricultural extension system (EAES).

The EDI had conceptualised and launched an innovative entrepreneurship development programme through distance learning and personal counselling DEBM in the year 1983. It was formerly known as open learning programme on business entrepreneurship (OLPE) which is a 1-year programme through open and distance learning and personal counselling. DEBM extension learners are equipped with the knowledge, skills and motivation to set up their sustainable enterprises and function dynamically and manage successfully. DPRs put by learners are bankable projects duly investigated as per guidelines provided by the EDI. All entrepreneurial business planning assessment regimes (EBPARs) have been conducted. The result analysis of 43 extension learners has been discussed. Agricultural green designs find that products and services are environmentally advantaged with sustainable production, good performance and prices (Mikulska, 2020). Pilot plant of a case study DPR-I on unsafe chromium from Ethiopian cotton roller ginneries and development of green design and art environment roller gin has been analysed (Vijayan, 2020g).



McCARTHY PRINCIPLE OF
COTTON ROLLER GINNING PROCESS

Rollers (chrome composite leather cladding) for cotton gins duly investigated in a ginning factory working on McCarthy's Principle is virtually investigated which has been demonstrated (Reference three figures and plates).



BATTERY OF DOUBLE ROLLER (DR) GINNING MACHINES

Coronavirus and byssinosis disease impact assessment (CIA) is investigated and discussed. Low-carbon and energy-efficient agricultural technologies of agricultural hi-tech industries make important contributions to mitigate the impacts of economic growth on global warming. SE provides innovation to improve agricultural science and technology extension system and sustainable agricultural mechanisation for mitigation of rural poverty in Ethiopia. This action-based research study on SE can promote policy recommendation to strengthen agricultural technical extension in Ethiopia. The CIA is investigated and discussed in Vijayan's (2020e, 2020f) studies.

GROUP OF OCCUPATIONALLY EXPOSED WORKERS IN PALA HOUSE AND BEATING OF LINT COTTON

Entrepreneurship is a process of setting up new enterprises to pursue opportunities. An entrepreneur organises, manages, assumes risks and enjoys profits of an enterprise or business successfully. Agricultural entrepreneurship is defined as a process of setting up an agricultural business at considerable risk (Mikulska, 2020). SE involves all the functions, activities and actions associated with the perceiving of new sustainable agricultural opportunities and the creation of sustainable agricultural enterprises to pursue them. Entrepreneurs perceive new agricultural opportunities and create enterprises to pursue it (Legge & Hindle, 2004). The challenges of the concept of SE that foster long-term protection of the environment and its habitants as the technological developments are guided by efficiency, productivity, profitability, health and environmental impacts, resource and energy conservation, waste management and social impacts, such as public convenience, unemployment and crime (Genc & Uslu, 2020; Glynn & Heinke, 2004). A sustainable entrepreneur combines efficiently and effectively six kinds of input resources that can be referred to as 'the six *M*s', such as manpower, machinery, material, method, money and market, in order to transform output goods, products or services (Vijayan, 2013, 2014b). Agricultural entrepreneurs consider the environment in agricultural planning and decision-making and arrive at actions which are more environmentally compatible. The concept of sustainability is highlighted when the resources do not get depleted due to business endeavours.

The expert counsellor and coordinator has got an autonomy to conduct a 1-year DEBM duly awarded by the EDI to 43 DEBM extension learners during the RYs 2007–2020. The CIA is also investigated and discussed. A DEBM counsellor has to provide the learners for necessary academic support and guidance; conduct work of course; two contact sessions; evaluation of assignments, tutorials, DPRs; and conduct term-end examinations. All DPRs have been formulated and appraised on agricultural green design and arts and structure of products and services. The course is recognised by the All India Council for Technical Education, university grants commission and distance education council, as per reference http://www.debm.ediindia.ac.in; reference agency code number 80410.

To address the need for developing new and committed agricultural entrepreneurs on a large scale, there is a need for an innovative agricultural technical extension programme through distance learning and personal counselling in EAES. A dynamic and pragmatic approach is introduced to create agricultural entrepreneurs on a large scale and to strengthen agricultural extension in Ethiopia.

1.1. Rationale and background

Education coupled with entrepreneurship is an intricate sustainable educational process towards sustainable development that can be focused on sustainable rural development and poverty eradication in Ethiopia from the emerging enterprise spirit (Vijayan, 2014a). Poverty is a result of inefficient use of resources (Vijayan, 2014b). If it aids in sustenance, then it can be eradicated. About 88% of the economic growth is created by innovation (Vijayan, 2013). To achieve this degree of excellence, resources must be utilised at optimum and sustainable levels should maximise efficiency as per the results analysis of optimum competitive and social markets (Vijayan, 2014c). The referred '*AK*' economic model for an optimum output level of economic growth is the product of engineering or technical factor level (A) and the capital (K) (Vijayan, 2014d). The solution is the creation of new sustainable agricultural enterprises by innovation. The entrepreneurial idea generation is based on the concept of entrepreneurship and innovation management. The economic growth development of Ethiopia is explained by the following three factors:

- The natural increase in the accumulation of labour potential,
- Capital accumulation or money with which a business is being started and run,
- Technological momentum can be referred as total factor productivity or efficiency in industrial processes.

The fundamental sustainable entrepreneurial momentum keeps the capital development dynamic, which comes from the new agricultural enterprise creation process, new agricultural products or service requirement from customers, the new methods of production and processes, new transportation, new agricultural markets and new forms of industrial organisation.

The standard production function (SPF) is expressed as

$$Y = f(C, L)$$

where Y = output, C = capital and L = labour

As knowledge is an important factor for the economic growth, SPF is modified as

$$Y = A(C, L)\, f(C, L)$$

where 'A' represents knowledge on engineering or technical extension, Y = output, C = capital, L = labour and f = SPF (product approach equation).

As per the given SPF, knowledge is a decisive production variation and optimum innovation level is required in engineering or technical extension system. The solution is the application of low-carbon and energy-efficient agricultural green product designs and structures.

2. Materials and methods

A 1-year DEBM course is offered by the EDI and sponsored by the Friedrich Naumann Stiftung – a foundation of international repute from Germany. A professional expert counsellor had conducted the DEBM course independently to 43 extension learners during the RYs 2007–2014 in 11 batches as per the EDI guidelines. The EDI has provided guidelines to conduct the course as per the website reference (http://www.debm.ediindia.ac.in). SE was the targeted research area. The methodology of the DEBM course includes self-instructional study material, assignment, personal counselling through professional expert counsellors and contact sessions during the course. The award of the diploma is based on the assessment of the assignments, DPRs submitted by the learners and performance in the final (TEE) examination. Forty-three green product design projects were submitted by the DEBM learners under the research guidance of an expert counsellor during the given RYs. A list of 43 extension learners and their academic records was uploaded online.

Figure 1 shows the important elements of entrepreneurship and innovation management for setting up of sustainable enterprises through sustainable enterprise creation process.

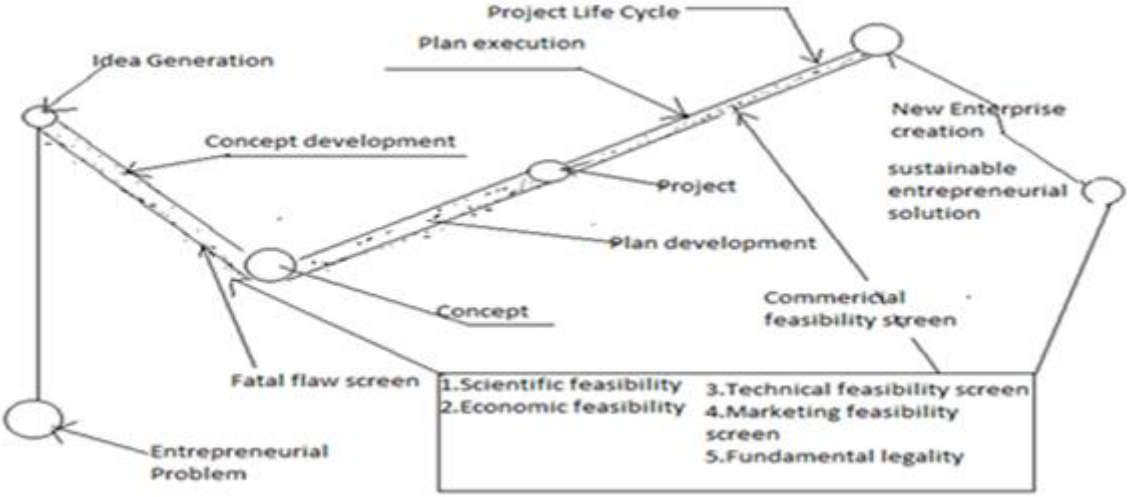


Figure 1. Schematic representation of entrepreneurship and innovation management for the sustainable enterprises creation process

All DEBM projects were screened for the five fatal flaws, namely (i) scientific feasibility, (ii) economic feasibility, (iii) technical feasibility, (iv) marketing feasibility and (v) fundamental legality. A sustainable entrepreneur or a trusted member of an entrepreneurial team should have skills in ethics, accounting, law, finance, team creation and marketing aspects in order to avoid failures in the process. A sustainable entrepreneur should have thorough knowledge on environmental management system (EMS) in order to skilfully bring about and manage resources efficiently to do a dedicated sustainable entrepreneurial process. EMS is a system of a continual cycle involving various processes such as planning, implementing, reviewing and improving the activities for the enterprises to comply with technical, economic, environmental and social obligations. EMS ensures that agricultural organisations identify and focus on improving areas where they have significant environmental and social impacts. Sustainable entrepreneurs follow the principle of process approach as shown in Figure-2. Sustainable agricultural technical extension system functions on the principle of process approach which is an activity-based management system as shown in Figure 2. Monitoring, measurement and control, including evaluation opportunities in the extension system through process approach, have been identified during the RYs. The CIA is also investigated and discussed.

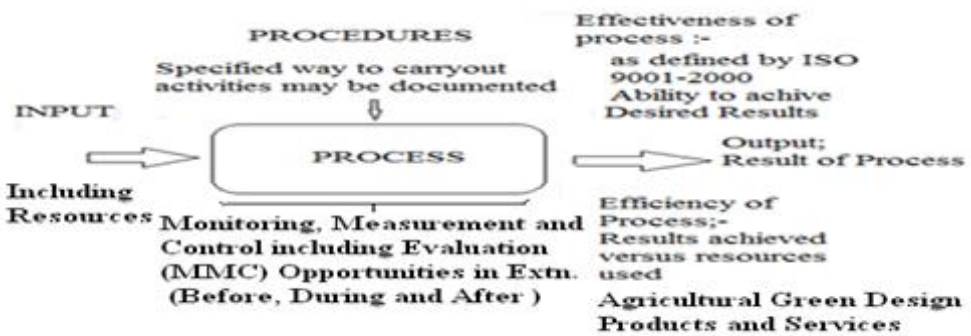


Figure 2. Schematic representation of the sustainable entrepreneurial process employed in the agricultural technical extension system

In order to make the venture a dynamic and growing sustainable enterprise, entrepreneurs have to skilfully bring about and manage resources efficiently to carry out dedicated sustainable entrepreneurial process. A process approach has been developed in order to bring labour, capital, technology, management, market, machineries, land, and information together, in new ways and to establish a new mechanism for sustainable rural development and eradicating poverty by providing scientific and technical services in agriculture. This approach enhances innovation in agricultural science and technology, improvement in the agricultural technological extension system and advancement in agricultural mechanisation and agricultural extension education. A methodology on eco-friendly rubberised cotton fabric roller development for cotton roller gins has been elaborated (Vijayan, 2007).

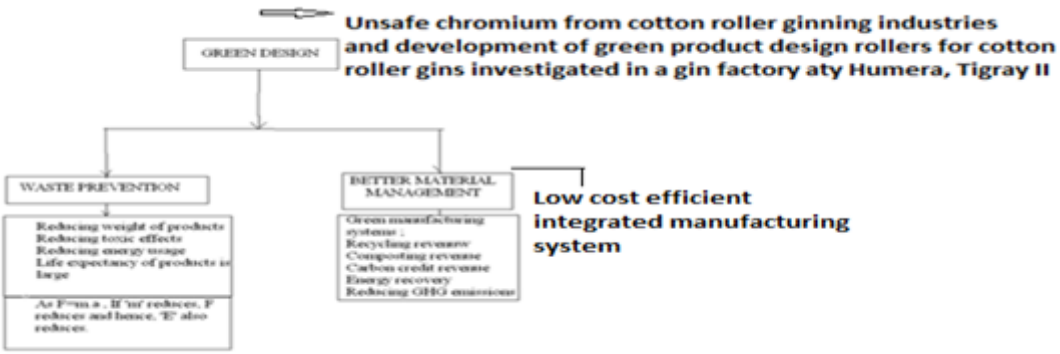


Figure 3. Case study of DPR-I: sustainable agricultural production and quality

All projects have been scrutinised for fatal flaws (Figure 3). The case study of DPR-I is discussed with regard to unsafe chromium from Ethiopian cotton roller ginneries and development of green design and arts environment roller gin rollers for cotton gins is duly investigated virtually in a ginning factory at Humera, Tigray II (Vijayan, 2014b). The study realises the hazards of chromium contamination and pollution caused by the use of chrome composite leather-clad (CCLC) rollers commonly used in Ethiopian cotton roller ginning industries and attempts to eliminate the chromium contamination and pollution during the complete process (Vijayan, 2014d, 2020h). The cotton roller ginning process is the mechanical separation of cotton fibres from their seeds by means of one or more rollers to which the fibres adhere to while the seeds are impeded and struck off or pulled loose (Gillum, 1974). Most of the cotton ginning operations are carried out using roller gins. The CCLC roller coverings contain about 18 000 to 30 000 mg/kg (ppm) as the total chromium of trivalent and hexavalent forms which are toxic to human health (Vijayan, 2007). When the seed-cotton is ginned, due to the persistent rubbing of CCLC rollers over the fixed knives, the cotton and its products get contaminated with the total chromium of trivalent and hexavalent forms. Hexavalent chromium leaks are a threat to cotton mill workers and those who wear cotton garments. Cotton garments get contaminated and polluted with toxic hexavalent chromium. Consumers of cotton garments and ginning mill workers are exposed to chromium pollution and are susceptible to health hazards. Toxic effects are produced by prolonged contact with airborne, solid or liquid chromium compounds even in small quantities. There are many chromium-based diseases that come out of the case industries (Rodriguez & Gomez, 2019; Vijayan, 2014d). Coronavirus diseases (COVID-19) and byssinosis diseases are investigated in cotton ginning industries.

To avert the problems in cotton ginning factories, an eco-friendly rubberised cotton fabric roller has been designed and developed. This green design and arts product has been successfully demonstrated for its performance (Figure 4). The objectives of the DPR-I were (1) to identify and study the environmental and health-related problems existing with the present CCLC rollers employed in cotton roller ginning industries, including the investigations of COVID-19 and byssinosis synergistic diseases among occupationally exposed Indian gin and mill workers, and (2) to virtually design and develop

green design cotton roller gin rollers for Ethiopian and Indian cotton roller gins in seed-cotton roller ginning factories and to evaluate its performance with a particular reference to technical, economic, environmental and social aspects in cotton ginning industries as per the author's sustainable design and art environment as per that shown in Figure 4.

Figure 4. Gin rollers of a double roller gin are made of rubberised cotton fabric roller covering material; green design – cast study DPR-I

3. Results and discussions

The entrepreneurial process is a set of interacting and interrelating entrepreneurship activities in an organised manner. Forty-three DPRs were formulated and appraised. The study material of the DEBM course and THE help provided by THE EDI counsellors enable the extension learners to set up their own agricultural businesses. The course enables learners to assess their entrepreneurial competencies and understand the weaknesses and the strengths to start a business. Overall, the extension course equips learners to function dynamically and acquire the requisite knowledge and skill to plan and successfully launch their own agricultural ventures. The result from the analysis of all projects has been uploaded in the website reference, which is available on request.

The success of a good entrepreneur is determined by a sustainable business plan development. It is an important document that provides critical aspects, basic assumptions and financial projections regarding the business venture. It is the basic document used to interest and attract financial support. All EBPARs have been evaluated. A sustainable entrepreneurial agricultural venture includes four key ingredients:

1. A talented lead sustainable entrepreneur with a balanced and compatible team.
2. A technically and environmentally sound and marketable idea for a green product or service.
3. A thorough venture analysis leading to a complete sustainable business plan.
4. A clear statement of the cash required, phased over the period until the venture becomes cash flow positive and an indication of the minimum equity component.

The DEBM extension learners were focused on working on agricultural green design and arts products and services oriented towards low-carbon and energy-efficient agricultural technologies during the RYs. Sustainable enterprises reduce environmental impacts associated with the manufacture, and the use and disposal of products. The output of green products and services that are sustainable production has environmental advantages with good performance and price (Masters & Wendell, 2008).

A case study of a DPR on unsafe chromium from Ethiopian cotton roller ginning industries and the development of green arts and design rollers for cotton roller gins is investigated in a cotton ginning factory at Humera, Tigray II, is the pilot plant which has been demonstrated. Such low-carbon and energy-efficient agricultural technologies of agricultural hi-tech industries can make important contributions to mitigate the impacts of economic growth on global warming (Vijayan, 2014c). SE

provides innovation to improve agricultural science and technology extension systems and sustainable agricultural mechanisation for mitigation of rural poverty in Ethiopia (Vijayan, 2014b). The CIA is also investigated and discussed. All DEBM extension learners were equipped with the knowledge, skills and motivation to set up their sustainable enterprises, and to function dynamically and manage successfully. The DEBM programme promotes the application of multidisciplinary technologies to agricultural industries and sustainable agricultural production with education and research. All DPRs can be accessed from the reference website, http://www.debm.ediindia.ac.in. DPRs may also be obtained from the EDI or counsellor.

As per the characteristics and assessment of DEBM extension learners, the handbook cum guidelines has been prepared with respect to entrepreneurial requirements to become a sustainable agricultural entrepreneur and to set up sustainable enterprise (Vijayan, 2013). All 15 steps are not discussed; however step number 6 is focused on, which has been considered an especially important step in SE.

Step-1: Decision to be self-employed to become an agricultural entrepreneur and to set up an enterprise.

Step-2: Product and Innovative Process selection including marketing feasibility.

Step-3: Deciding on the size of the unit

Step-4: Location of the unit

Step-5: Technical and financial feasibility of the unit

Step-6: Environmental and social feasibility of the unit.

Step-7: Awareness on statutory requirements including fundamental legality.

Step-8: Infrastructure for the unit

Step-9: Working out project cost

Step-10: Provisional micro-, small- and medium-scale industry (SSI/MSME) registration

Step-11: Biodata of the agricultural entrepreneur

Step-12: Preparation of a sustainable business plan

Step-13: Project implementation schedule (PIS)

Step-14: Project report preparation – bankable project report

(Preliminary project report and DPR)

Step-15: Financial assistance for setting up an agricultural enterprise.

Step-16: Environment and sustainability reports' assessment and evaluation.

3.1. Step-6: Environmental and social feasibility including sustainability of the project

A project may be technically and economically feasible but can be implemented only if environmentally and socially feasible. The EIA can be defined as the systematic identification and evaluation of the potential projects, plans, programmes or legislative actions relative to the physical–chemical, biological, cultural, and socioeconomic components of the total environment. The purpose of the EIA process is to encourage the consideration of the environment in planning and decision-making and to ultimately arrive at actions which are more environmentally compatible. It is important to conduct social impact assessments and sustainability health impact assessments to avert COVID-19 biochemical epidemic and pandemic disasters separately for the projects, for example, COVID-19 pandemic (Genc & Uslu, 2020; Simbarashe & Zirima, 2020; Vijayan, 2020c, 2020d).

This action-based research study on SE promotes policy recommendation to strengthen agricultural extension in Ethiopia and India based on the study conducted in India (Vijayan, 2013).

4. Conclusion

Agricultural entrepreneurs can be developed through well-conceived and well-directed training programmes around thrust areas, thus advancing the frontiers of theories and practice SE. This action-based research and extension field study can give avenue for national development specifically to EAES. SE challenges and prospects that foster long-term protection of the environment and its habitants as the technological developments are guided by efficiency, productivity, profitability, health and environmental impacts, resource and energy conservation, waste management and social impacts, such as public convenience, unemployment and crime. The development of new knowledge is an important factor for the economic growth of Ethiopia. The SPF has indicated that knowledge is a decisive production variation. About 88% of the economic growth is created by innovation. Agricultural project planning and decision-making should include the integrated consideration of technical, economic, environmental, social and other factors. The most important of these considerations can be referred to as 'the four *E*s' (engineering or technical, economics, environment and ethics) in planning and decision-making process. A project may be technically and economically feasible, but it can be implemented only if environmentally and socially feasible as per the CIA which is investigated and discussed. A process approach has been developed in order to bring labour, capital, technology, management, market, machineries, land and information together in new ways and to establish a new mechanism for sustainable rural development and eradicate poverty by providing scientific and technical services in agriculture. Monitoring, measurement and control, including evaluation opportunities in extension system through process approach, have been identified during the RYs.

The objective of the DEBM extension course is 'New Enterprise Creation and Management'. The DEBM course develops motivation to extension learners and reinforces agricultural entrepreneurial traits with the spirit of setting up sustainable agricultural enterprises. Forty-three green design and art projects proposed by the DEBM extension learners attached with the counsellor during the RYs 2007–2020 have been formulated and appraised. Projects were screened for five fatal flaws, viz. (i) scientific feasibility, (ii) economic feasibility, (iii) technical feasibility, (iv) marketing feasibility and (v) fundamental legality. EBPARs have been evaluated too. The learners have set up their own sustainable enterprises based on sustainable creation process under the research guidance of the expert counsellor. Sustainable agricultural enterprises were set up to focus on green design, art products and services that reduce environmental impacts associated with the manufacture and use and disposal of products. The results are environmental advantages with sustainable production, good performance and price. The extension learners have been duly awarded a diploma by the EDI.

Education coupled with entrepreneurship is an intricate sustainable educational process towards sustainable development that can be focused on sustainable rural development and poverty eradication in Ethiopia from the emerging enterprise spirit. Agricultural cleaner technologies can produce more output than conventional technologies by causing less damage to the environment. Agricultural greener technologies are those that are less polluting, use resources in a sustainable manner, recycle more of their wastes and products and handle all residues in a more environmental acceptable way. A pilot plant of a DPR-I on unsafe chromium from Ethiopian cotton roller ginneries and development of green design and arts roller gin rollers for cotton gins is virtually investigated in a ginning factory at Humera, Tigray II. This green design and art product has been successfully demonstrated for its performance.

The DEBM study material and the help provided by the counsellor enabled the learners to set up their own agricultural enterprises. The DEBM course assures learners to assess their entrepreneurial competencies and understand weakness and strength to start business. The study can promote policy recommendation to strengthen agricultural extension in Ethiopia based on the entrepreneurial

research conducted in India. The programme promotes the application of multidisciplinary technologies to agricultural industries and sustainable agricultural production with education and research. It is recommended that such kind of an entrepreneurial service system with financial support is essential for sustainable development. As recommended in this paper, it is imperative that such a dynamic and pragmatic approach be implemented to create agricultural entrepreneurs on a large scale in Ethiopia.

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References

Alonso, A. A., Elias – Ortega, A., & Arcos – Alonso, A. (2020). Intergenerational service-learning, sustainability and university social responsibility: A pilot study. *Cypriot Journal of Educational Sciences, 15*(6), 1629–1641. https://doi.org/10.18844/cjes.v15i6.5322

Genc, F., & Uslu, A. (2020). Nursing approaches and their effect on the health of elderly with COVID-19. *International Journal of Emerging Trends in Health Sciences, 4*(3), 100–110. https://un-pub.eu/ojs/index.php/ijeths/article/view/5311

Gillum, M. N. (1974). *Properties of roller gin roller covering materials (No. 1490)*. US Department of Agriculture. https://tinyurl.com/yfjcg3b8

Glynn, H. J., & Heinke, G. W. (2004). *Environmental science and engineering* (p. 9). Prentice –Hall of India Private Limited. https://trove.nla.gov.au/work/13975850

Legge, J. M., & Hindle, K. G. (2004). *Entrepreneurship: context, vision, and planning*. Palgrave Macmillan. http://hdl.handle.net/10536/DRO/DU:30021733

Masters, G., & Wendell, E. (2008). *Introduction to environmental engineering and science* (3rd ed., pp. 610–612). PHI Learning P Ltd. https://www.amazon.com/Introduction-Environmental-Engineering-Science-3rd/dp/0131481932

Mikulska, K. S. (2020). Issues related to creation of borders of the agricultural production space in land consolidation processes in Poland with consideration of soil, water and agricultural landscape protection. *World Journal of Environmental Research, 10*(1), 01–08. https://doi.org/10.18844/wjer.v10i1.4725

Rodriguez, E. M., & Gomez Carrillo, V. D. R. (2019). Ecofeminism and sustainable entrepreneurship: An alternative view of the planet. *New Trends and Issues Proceedings on Humanities and Social Sciences, 6*(1), 100–107. https://doi.org/10.18844/prosoc.v6i1.4160

Simbarashe, T., & Zirima, H. (2020). Qualitative study on the positive implications of the COVID-19 lockdown in Zimbabwe: A parent's perspective. *Global Journal of Psychology Research: New Trends and Issues, 10*(2), 189–200. https://doi.org/10.18844/gjpr.v10i2.4788

Vijayan, I. G. (2007). Eco-friendly rubberized cotton fabric roller for ginning machines. *Journal of Agricultural Safety and Health, 13*(1), 33–43. https://elibrary.asabe.org/abstract.asp?aid=22310

Vijayan, I. G. (2013). *'Sustainable Entrepreneurship Education is A New Dimension in Higher Technical Education for Sustainability'*. In Abstracts Book of the 43 rd ISTE National Annual Convention 2013 Theme: 'Empowering Technical Education to Address Sustainability and Global Competitiveness', Sub theme: New Dimensions in Higher Technical Education for Sustainability (ISBN: 978-93-5142-315-7) Organized by Indian Society for Technical Education-T.K. Institute of Engineering &Technology, Warananagar, Tal: Panhala, Dist. Kolhapur-416 113 on 19-21 st December 2013, PP.23. https://tinyurl.com/yecvzajc

Vijayan, I. G. (2014a). *'Education coupled with entrepreneurial process approach towards sustainable development'*. In Abstracts & Proceedings Book of the Global Conference on Contemporary Issues in Education (ISSN: 18770428) organized by the Academic World Education and Research Center, www.awer-center.org, at Las Vegas, USA during 12-14, July 2014, Published by Elsevier Ltd., 16:10–16: 30 (20 minutes) GST, 21:40 TO 22:00 IST. https://issuu.com/vijayangurumurthyiyer/docs/nursing_webinar

Vijayan, I. G. (2014b). *'Sustainable enterprise creation process towards economic development of Ethiopia'*. In Abstracts book of the First National Research Conference in Technology Transfer held during August 8–9, 2014 at Ethiopian Institute of Technology, Mekelle University, Ethiopia, Mekelle, and pp. 10-11. https://tinyurl.com/ydun43nk

Vijayan, I. G. (2014c). *'Toxic tanning without environmental and safety protection in unsafe chromium leather tanneries in Ethiopia'*. In Proceeding and abstract book of the National Symposium on Science, Technology and Innovation for National Development, ISBN (13 digits) 978-99944-889-2-6 (STIND/2014/136) held in Wollega University during 21 and 22 March 2014 at Nekemte, South Ethiopia Published by Wollega University Press Proceedings pp. 237 and 238 and Abstract Book pp. 46. https://www.academia.edu/43092875/Academia_edu_Dr_Vijayan_Gurumurthy_Iyer

Vijayan, I. G. (2014d). *'Unsafe chromium from cotton ginneries in Ethiopia and development of a rubberized cotton fabric roller for cotton roller gins'*. In Proceeding and Abstract Book of the National Symposium on Science , Technology and Innovation for National Development, ISBN (13 digits) 978-99944-889-2-6 (STIND/2014/136) held in Wollega University during 21 and 22 March 2014 at Nekemte, South Ethiopia published by Wollega University Press Proceedings pp. 204–216 and 238 and Abstract Book pp. 49. http://www.starjournal.org/wu-press.html

Vijayan, I. G. (2020a). 'Strategic environmental assessment (Sea) process towards sustainable toxicological management development for the toxicological industries to achieve business excellence'. *Journal of Emerging Trends in Engineering and Applied Sciences (JETEAS)* (ISSN: 2141-7016)*, 11*(3):91–108, © Scholarlink Research Institute, 2020. scholarlinkinstitute/jeteas.org https://issuu.com/vijayangurumurthyiyer/docs/strategic_environmental_assessment_online

Vijayan, I. G. (2020b). Environmental health impact assessment of chrome composite leather-clad rollers used by Indian cotton roller ginning industries and design and development of Eco-friendly alternatives. *International Journal of Emerging Trends in Health Sciences, 4*(1), 36–67. https://www.un-pub.eu/ojs/index.php/ijeths/article/view/4496

Vijayan, I. G. (2020c). Strategic environmental assessment (SEA) process for cotton ginning and textile science and engineering systems towards inclusive sustainable development. *World Journal of Textile Engineering and Technology, (ISSN: 2415-5489) Open Journal Systems (OJS), 6*, 21–38. https://nscku.com/wp-content/uploads/2020/07/WJTETV6A3-Iyer.pdf

Vijayan, I. G. (2020d). '*Environmental impact assessment (EIA) educational process for the effective and efficient learning, teaching and sustainable education leadership'*. Draft Program for Online Conference Presentation 11th World Conference on Learning, Teaching, and Educational Leadership(WCLTA-2020) Christian University St.Petersburg , Russia , 13-15 , September 2020 , Session-II, on 13 th Sep 2020 Sunday GMT+2 Session 3, 18:00-19:40, Organized by The Academic Events Group (TAEG), https://www.globalcenter.info/wclta/ PP.11.

Vijayan, I. G. (2020e). *Coronavirus impact assessment (CIA) for control of infection criticality due to novel coronavirus pandemic and epidemic disasters*. Draft Program for online conference presentation 7th World Conference on Health Sciences HSCI 2020, Christian University St.Petersburg, Russia , 13-15 , September 2020, Session-II, on 13th Sep 2020 Sunday GMT 15:40-17:30, Organized by The Academic Events Group (TAEG), www.h-sci.org PP.12.

Vijayan, I. G. (2020f). *Investigations on integration of quality and safety management in hospital industries for measurement, monitoring and control of infection criticality due to novel coronavirus epidemic disasters*. 4 th International Conference on Nursing University of Barcelona, 04-05 September 2020., http://www.ic-on.org/Draft PP.10/Program Abstract book- p. 08. http://www.starjournal.org/wu-press.html. https://doi.org/10.1016/j.sbspro.2015.02.368 pp. 17, 32–33. https://www.kongreuzmani.com/4-international-congress-on-nursing-icon-2020.html

Vijayan, I. G. (2020g). Integration of quality, safety and sustainability management for hospital industries towards sustainable development. 'Webinar on healthcare and nursing, nursing virtual summit 2020' title entitled held during World Healthcare and Nursing Webinar on Advances and Innovation in Healthcare and Nursing, (WHCN), Organized By IRIS Scientific Group Final Program pp. 13, in Zoom Login ID, https://irisscientificgroup.com/conferences/healthcare-nursing/webinar on 22nd August 2020 at 12:00 to 19:00 GMT, 5.30 PM TO 12: 30 PM IST, Oral Presentation of Speaker. https://issuu.com/vijayangurumurthyiyer/docs/nursing_webinar

Vijayan, I. G. (2020h). '*Strategic environmental assessment (Sea) process for sustainable administrative and political sciences towards sustainable development' Draft program for online virtual presentation 9 th world congress of administrative and political Sciences (ADPOL-2020), program book 12, abstract book page number 8*. Porto, Portugal, 01–03, October 2020, 02 October 2020, Session-IV, 14.40–16.40, Porto Time GMT+2, Organized by The Academic Events Group (TAEG), www.adpol.org, https://issuu.com/vijayangurumurthyiyer/docs/adpol-draft-program
https://issuu.com/vijayangurumurthyiyer/docs/adpol-draft-program_7150ee13099ac2
https://issuu.com/vijayangurumurthyiyer/docs/adpol_30_th_sep_2020-draft_program__1___1_
https://issuu.com/vijayangurumurthyiyer