iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 Issue: V Month of publication: May 2022

DOI: https://doi.org/10.22214/ijraset.2022.42615

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue V May 2022- Available at www.ijraset.com

Management of Agricultural Produces and Lifecycle

Sakshi Shevade
Research Scholar, MCA, Thakur Institute of Management Studies, Career Development & Research (TIMSCDR) Mumbai 400101, India

Abstract: The agricultural revolution was the key development in the rise of human civilization. It's a varied field that produces a wide array of products which are important to us. As our global populations are growing faster the competition for natural resources will increase resulting in pressure on agricultural production of food, fiber, energy, various high-value by-products, etc. With upgraded concerns related to environmental impacts associated with the needs of a growing population, a life cycle assessment (LCA) framework will help to determine areas of greatest impact. The LCA methodology was mainly developed for industrial operations but we are using them in a wider range of fields which includes agriculture. Many factors increase the complexity of determining impacts associated with agricultural production The lack of consistent methodology of some impacts that are of major concern to agriculture (e.g., land and water usage) increases the difficulty or complications of this analysis. This paper attempts to review some of these issues and give perspective to the LCA expert in the field of agriculture.
Keywords: Life cycle assessment, Ex-ante LCA, Technology assessment, New technology, Emerging technology

I. INTRODUCTION

LCA is a well-known assessment. LCA is a tool that provides, identifies, and makes a perception of the environmental impacts of products and services over their lifecycle. The existing manuals give guidance which they typically apply to the model and assess environmental impacts ex-post, meaning that information is available from empirical experience after products have been commercially in use for extended periods. If LCA is applied in an ex-ante manner before the technology is commercially deployed at scale this information will not be available. The main challenges are identified when implying LCA in an ex-ante manner and proposing a route forward in dealing with these challenges that combine intuitions from other disciplinary fields. The first challenge is 1)-For incumbent and new technology systems how to model consistent future foreground systems and the second challenge is 2)-how to model future background systems. The solution is to transform existing LCI databases in the direction of future contexts, informed by the Integrated Assessment Models (IAMs) that provide scenarios in line with the Shared Socioeconomic Pathways (SSPs). Finally, uncertainty in ex-ante LCA is different from in ex-post LCAs. The major difference with conventional LCA studies is the highly unknown information for the future. More attention should be attributed to the discussion on these uncertainties, both the data used to acknowledge this and the design of the assessment. Responsive evaluation can play a vital role here. This will expand the transparency of the results because the relevant stakeholders and experts are involved. In this manner technology, designers, and other stakeholders derive perception on the influence of design choices (that are important, but hard to influence) on the potential environmental impacts of their foreseen technology.

Fig.1: Life Cycle Assessment

II. GOAL AND SCOPE DEFINITION

The goal and scope definition sets up the basic methodology is to ensure uniformity throughout the analysis of the specific LCA to be conducted. This portion of the analysis is vital since it sets the stage for how the entire agricultural system will be interrupted.

For ex-ante LCA studies is that new technologies are developed to improve the status of ex-ante by applying new technology. These new technologies are likely to compete with well-established grown technologies. Comparison with these incumbent technologies is the essential part of the assessment. The essential goal of any ex-ante LCA is to compare the future potential environmental performance of the new technology, vis-a-vis one or multiple incumbent technologies to gain perceptions on the next developments of these technologies can guide upcoming efforts in the development of the new technology. So we see technology developers are the main audience for these studies.

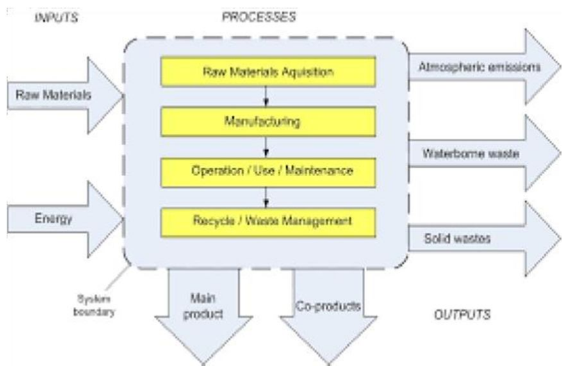


Fig.3.: ex-ante LCA

(Defining ex-ante LCA)

A growing number of studies apply LCA to new, emerging, or future technologies and product systems. A variety of approaches and modes of conducting forward-looking LCA that can be applied for these assessments is reported in the literature

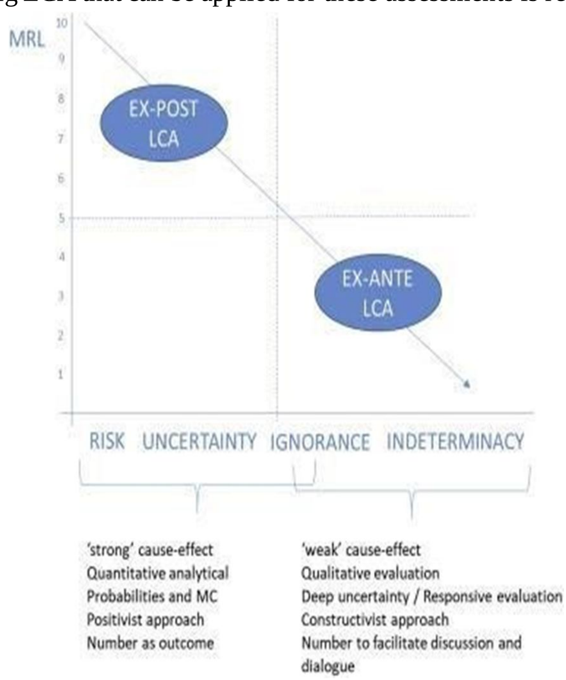


Fig.2.: ex-ante LCA

A. GOAL(S)

There are many reasons why the use of an LCA must be warranted, encouragement from processing facilities, regulatory requirements, encouragement by a trade organization (e.g., National Cotton Council of America), and improving public perception of specific products.

B. Scope

The scope of the analysis may be altered depending on why the LCA is being used and according to the intended audience. When LCA is used for comparative purposes, it might be possible to limit the scope to areas that will be affected by the scenario modifications, since these differences are the main interest (e.g., when assessing various grain drying possibilities, field operations may remain static between scenarios).

III. LCA STUDY CONSISTS OF FOUR STAGES

1) *Stage 1:* With the help of goal and scope we can analyze how big a part of the product life cycle will be taken in assessment and to what end the will assessment be serving.
2) *Stage 2:* In the second step, inventory analysis describes the material and describes the energy that flows within the product system and especially its interaction with the environment, consumed raw materials, and emissions to the environment.
3) *Stage 3:* For impact assessment details from inventory analysis serve. The measure results of all impact categories are detailed in the third step.
4) *Stage 4:* The life cycle interpretation involves critical review, determination of data sensitivity, and result presentation.

The following figure gives the four stages under the of operation because the environmental impact at

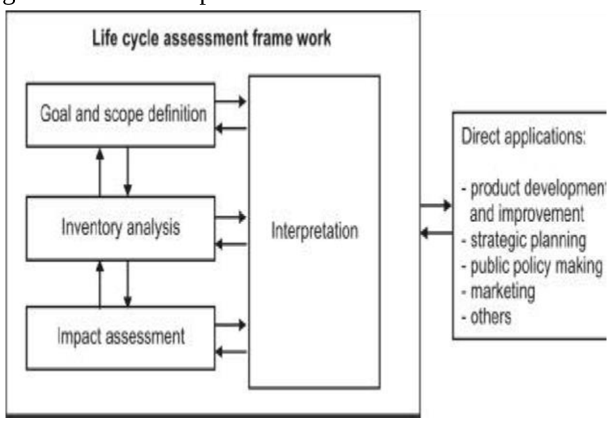


Fig.4.: ex-ante LCA

ISO 14040 guidelines.

IV. MODELLING CONSISTENT FUTURE FOREGROUND SYSTEMS

When a new technology is standard against the incumbent then it becomes important that modeling choices consistently represent the compared systems, including the background system at a time that the new technology is supposed or expected to be business operational. The LCA practitioner has to be aware and consider that these three parts of the model might be at different levels of development. On these three parts, “knowledge” and “data “are most likely only available on different scales of operation. Knowledge and data depending on the level of development of the technologies themselves.

At the time of execution of an ex-ante LCA, the new technologies are typically in their technology or development route. It will likely take a fair amount of time to get from patent to market introduction. Only at this point does the new technology start to compete with the incumbent technology. With the help of historic data, this period can be defined as up to 25 years, despite this time frame seems to decrease for newer technologies (Hirooka, 2006). Aftermarket penetration will take the same amount of time for the technology to become mature (Kramer, 2009). When comparing new technologies to incumbent technologies, it is very important to take into consideration their level of development and that considerable time is required before technologies operate at similar (comparable) scales. To explain this in ex-ante LCA we build on work done by, who discuss the role of technology growth in LCA and introduced the concept of TRL-(Technology Readiness Levels) and MRL (Manufacturing Readiness Levels) to the field of LCA. They stress that the outcomes of LCA studies on emerging technologies should be represented about their scale because technology readiness osnulgygests that technology is feasible, but does not provide informaatisotno whether the technology is ready for large-scale manufacturing and operation. It is very easy to recognize or understand technologies with a low M.RL

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue V May 2022- Available at www.ijraset.com

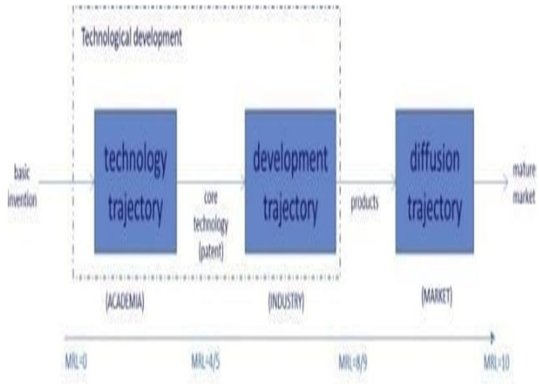


Fig.5. Innovation trajectories and development over time-based lower levels (kW scales) is most likely not linearly scalable to higher levels (GW scales), while the new technologies suggested are intentional to perform at those higher scales. We stick to the MRL on Hirooka (2006)

The main challenge is defining the states of the compared technologies consistently by making the same choices on the anticipated operation and scaling up technologies from the lab to its industrial state. The subjective choices, individual preferences, and perceptions of the practitioners and the technology developers are an integral part of the modeling process and are also bound to be affected by the built- in changes in basic socio-economic conditions over time.

V. SELECTING AND MODELLING THE INCUMBENT TECHNOLOGY INTO THE FUTURE

Selecting the incumbent technology should be based on the same functionality as it is common in LCA. Although, new technologies often have multiple functionalities that often are not found simultaneously in one existing incumbent technology. That's why it is important to be very clear on the intended application of new technology, although this is often uncertain. Keeping this implicit and qualitatively discussing multiple intuitive functions makes it is very difficult if not impossible to perform a honest assessment. Moreover, this approach does not allow to give perceptions of the potential implications of certain design choices.

Choosing the potential application of technology could be guided by the public discourse, but could also be determined by available data for the perceptions desired. At least a transparent statement on this needs to be there. Even after a product is at

MRL 9 or 10 it is still possible that tiny advances and developments take place. It may be possible that the incumbent technology, typically operational at an MRL of 10, will have developed further at the time that the new technology will start entering the market. In their future scenario.

VI. MODELLING A NEW TECHNOLOGY AT SCALE INTO THE FUTURE

The biggest question for modeling a new technology at the same scale as the incumbent is how to base a full-scale model of the technology on the available knowledge from the lab and the technology route. The use of technology learning curves that describe technology progress in terms of (decreasing costs as a function of accumulating experience with that technology)

One should, however, be informed that a learning curve

"hardly represents a physical law, but rather describes a persistent empirical phenomenon with still remarkable uncertainties surrounding both the approximation of specific learning rates and their extrapolation in cases.

Another way is to combine learning curve perceptions with knowledge and experience on 'upscaling' from the field of e.g. chemical engineering, The framework is provided in which LCA practitioners with limited chemical engineering knowledge can obtain a first estimate about the impacts a chemical produced at an industrial scale when only laboratory-scale data is available. The authors emphasize that the framework is only applicable to existing technologies and not for new technologies in the future. It is hard to say if the approach applies to new technologies in the early stages of development. eight different upscaling methods were reviewed by (2019) that are used in chemical engineering to fill up data gaps in (LCA). These methods do not consider any future developments, however, these approaches are not equipped to look into the future, they might provide a starting point for defining scenarios. Including structure, analysis is found to be critical in up-scaling exercises since it makes the effect of assumptions and uncertainty transparent (F Piccinno et al., 2016). Even we can see that the methods ranked by Parvatker and Eckelman (2019) are indicative of application at certain MRL levels and are also in line with levels of uncertainty encountered.

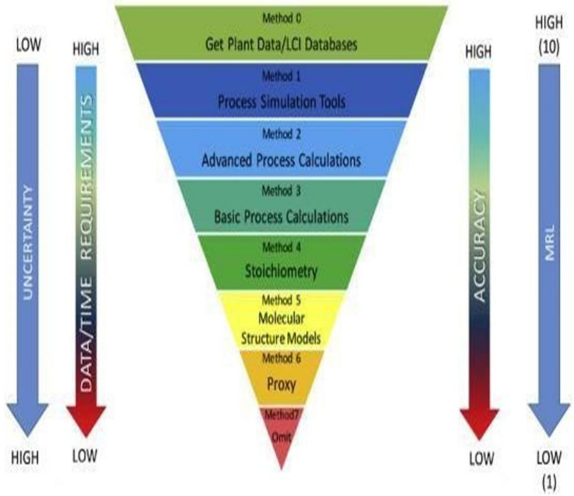


Fig.6.: Hierarchy of methods.

In conclusion, we can say that extensive guidance for modeling new technologies in the future exists (e.g. the field of chemical engineering). The one remaining question is how we can perform some form of upscaling in other fields like nano-, energy, or food technology. For now, the only option is to organize a structured discussion with experts on the future expectations and potential of new technologies. The practitioner can only gather enough information to investigate different hypothetical routes of development through the use of scenarios.

VII. ADVANTAGES

Life Cycle Assessment is widely used to support sustainable development. LCA is a modeling tool to assess environmental impacts related to a product during its entire lifespan: from raw material extraction through processing, manufacturing, distribution, use, and disposal or recycling. With the help of LCA, decision-makers can compare two products and select the product that has the lowest impact on the environment.

As LCA considers the full life cycle and it avoids burden shifting: it avoids reducing the environmental impact in one stage while increasing the impact at other stages of the life cycle. rather than optimizing one indicator, LCA also provides a holistic view on the environmental impacts, to avoid optimizing one environmental indicator without considering the adverse effects on the other indicators. LCA provides the possibility to identify hotspots in the environmental impact: it also provides perception in how to improve processes to achieve reduced environmental effects. LCA is based on internationally accepted standards 1,2 and is recognized as the best approach to quantify the environmental impacts of a product on the environment during its entire life cycle.

VIII. LIMITATIONS

LCA has some limitations that sometimes lead to skepticism about LCA results. The studies of LCA depend on presumptions and cases, as LCA analyses the real world in a simplified model. Studies can also have a different range so one of the studies can leave out impacts or processes that another study has included. The presumptions, cases, and scope may vary from one study to the other, leading to different LCA results. These different ways in LCA approaches and results may be baffling, especially for non-experts. Performing an LCA study is resource-consuming, mainly due to the large amount of data needed. If data collection is poor or inadequate data is available, the study will not guide solid conclusions.

IX. DISCUSSION AND CONCLUSIONS

This paper discovered how to perform an environmental assessment of upcoming and potential new technologies that are still in their R&D phase. We discovered the main challenges in comparison with conventional ex-post LCA practices and propose practical remedies for coping with these challenges. We chose to use the term "ex-ante LCA" and defined this as accomplishing an environmental life cycle assessment of new and upcoming technology before it is commercially applied to guide R&D decisions to make this new technology environmentally competitive with the required and existing technology mix.

REFERENCES

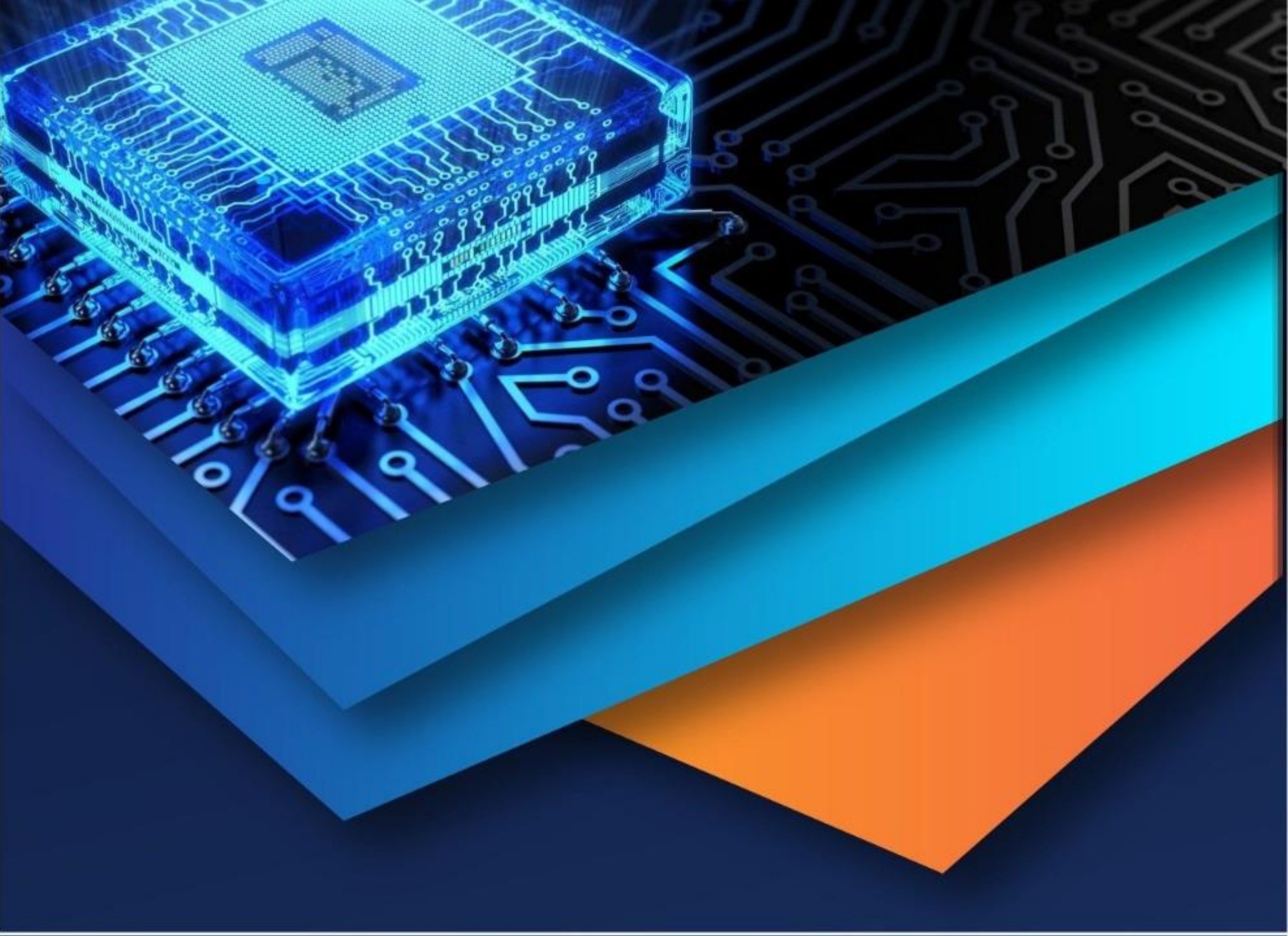
[1] https://www.sciencedirect.com/science/article/pii/S0959652620309513#fig3

[2] https://www.sciencedirect.com/topics/earth-and-planetary- sciences/life-cycle- assessment#:~:text=Life%20cycle%20assessment%20(LCA)%20is,4)%20interpretation%20of%20the%20results

[3] https://www.sciencedirect.com/topics/agricultural-and- biological-sciences/agricultural-management

[4] http://fibrenet.eu/index.php?id=blog-post-eleven

[5] International Standard Organisation (ISO). Environmental management - Life cycle assessment: Principles and framework. ISO14040. (2006).



10.22214/IJRASET

INDEX COPERNICUS 45.98

ISRA JIF IMPACT FACTOR: 7.129

TOGETHER WE REACH THE GOAL IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY