ASIA-PACIFIC NETWORK FOR GLOBAL CHANGE RESEARCH

CAPaBLE Programme Final Report



Project Reference Number: CBA2016-08SY-Weerakkody

Capacity Development of Research-Policy-Technology Personnel in Sri Lanka on Global Change and Sustainability

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"Capacity Development of Research-Policy-Technology Personnel in Sri Lanka on Global Change and Sustainability"

Final Report submitted to APN

OVERVIEW OF PROJECT WORK AND OUTCOMES

1. Project Information

Project Duration	**:**	August 01, 2016 to July 31, 2017
Funding Awarded	**:**	US$ 22,000 for Year 1/One Year
Key organizations involved	**:**	1. Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI), Colombo, Sri Lanka • Renuka Weerakkody • Sharmini K. Kumara • S. Epasinghe • Susila Lurdu • Chinthaka Jayasooriya • Rasika Wijesinghe • Prasanna Wijesinghe • Amal Dissanayake 2. University of Sri Jayewardenepura, Sri Lanka • Dr. Prasanthi Gunawardena 3. University of Colombo, Sri Lanka • Dr. P.M. Dunusinghe

2. Project Summary

National agricultural policy has an important stake in setting the background for sustainable development of agrarian sector of the country. Even though the agricultural policy of Sri Lanka is envisioned to achieve the same, an array of social, economic and environmental failures prevailing in the sector poses the question of sectoral sustainability. This stresses the need for agrarian policies with system's perspective to address a wide ranging issues and problems. In-depth capacity building among diverse stakeholders of the agrarian sector seems paramount in this respect.

The initial capacity building exercise led to improve the conceptual and analytical capacity of HARTI academics on assessing agricultural sustainability which was substantively evident through the successful completion of a research undertaken and outputs generated. Both dimensional and composite indices constructed through the proposed sustainability assessment framework well represented the relative status of sustainability of prominent food crop production systems in the south east dry zone of Sri Lanka, a revelation of ground level reality of farming, related issues, casual factors and improvement options.

Subsequent science policy dialogue turned out to be an interactive platform for the scientists and senior agrarian policymakers. It also led to improving national capacity to formulate agrarian policies based on the outputs of sustainability assessment framework, an outstanding project achievement with considerable future impacts on the sustained agrarian

development. Overall, the project set an excellent example of straightforward integration of research knowledge as inputs for capacity development among diverse stakeholders in agrarian research and policy formulation which led to identifying policy interventions and actions towards agricultural sustainability. The scientific input provided for improving farmer education programmes of the Department of Agriculture and promoting diffusion of sustainability knowledge among the rural farming communities are vital in sustainable agrarian development.

Keywords: Agrarian Policy, Sustainability Indices, Capacity Development, Science Policy Dialogue

3. Activities Undertaken

- Training workshop for the academic staff of HARTI aiming at raising awareness and capacity development among HARTI researchers on wide-ranging social, environmental and economic issues and problems of agriculture and their link to global change and sustainability.
- Research leading to assessing agricultural sustainability of selected food crop production systems (FCPSs) in the South East Dry Zone of Sri Lanka (SEDZSL).
- Science-policy dialogue to disseminate the findings of the research component.
- Training of Trainers (TOT) programmes at the study locations to disseminate research findings to the field level.
- Farmer training programmes at the field locations.
- Development of website – www.apnsustanabilityknowledge.com

4. Key facts/figures

- Forty members of HARTI academic staffs were trained in assessing agricultural sustainability.
- Undertook a research study covering five prominent rain-fed FCPSs in the SEDZSL.
- Sustainability indices were constructed on social, economic and environmental dimensions with an ultimate composite sustainability index for each system.
- Capacitated 25 senior policymakers around the project outputs.
- Thirty extension personnel at the study location were trained as trainees of trainers (TOT).
- Nine hundred farmer representatives were equipped with agricultural sustainability knowledge by 30 trainers above in 90 farmer training programmes (Easy-to-Learn sessions) held at study locations.
- Launched the project website –http://www.apnsustanabilityknowledge.com
- Published proceedings of HARTI training workshop.

5. Potential for further work

Lessons learnt from the project and its outputs accompany a high potential for future work in the related disciplines and aspects. Observing the fact that sustainability of a dynamic system is location specific and time bound, the sustainability framework proposed through this project for measuring agricultural sustainability will be promoted

as a policy tool in planning and resource allocation for food crop production at different tiers from national and regional to grassroots level. The project leader and collaborators with the HARTI research team (TEAM) in collaboration with the Ministry of Agriculture and other relevant line ministries will take necessary steps to materialize the concept.

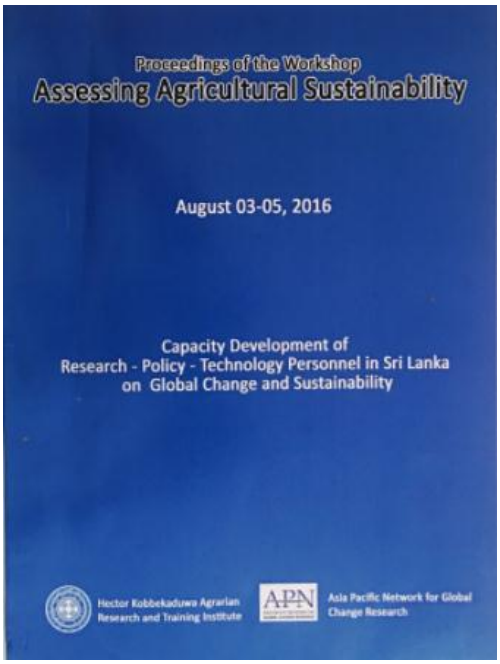
6. Publications

Epasinghe, S., Lurdu, M.D.S., Dissanayake, D.M.A.C., & Weerakkody, P.R. (Forthcoming). *Sustainability of Maize production in South East Dry Zone of Sri Lanka*. Hector Kobbekaduwa Agrarian Research and Training Institute, Colombo, Sri Lanka.

Jayasooriya, H.J.C., Wijesinghe, I.P.P.M., Wijesinghe, R.D. (Forthcoming). *Sustainability of Prominent Food Crop Production Systems in South East Dry Zone of Sri Lanka with special reference to Ground nut, Green gram and Sugarcane Production*. Hector Kobbekaduwa Agrarian Research and Training Institute, Colombo, Sri Lanka.

Lurdu, M.D.S., Epasinghe, S., Weerakkody, P.R. (Forthcoming). *Red onion production in South East Dry Zone of Sri Lanka: Sustainability Issues and Options for Improvement*. Hector Kobbekaduwa Agrarian Research and Training Institute, Colombo, Sri Lanka.

Weerakkody, P.R., Dunusinghe, P.M., & Gunawardena, P. (2017). *Assessing Agricultural Sustainability*. Proceedings of the Workshop. Hector Kobbekaduwa Agrarian Research and Training Institute, Colombo, Sri Lanka.



7. Awards and honours

Not Applicable

8. Pull quote

“As a researcher who recently joined HARTI, I have been blessed to join the project - Capacity Development of Research-Policy-Technology Personnel in Sri Lanka’ which I consider the most valuable opportunity I ever received as an academic. As an inexperienced young sociologist, the great exposure which I received in agricultural, economic and environmental aspects made my thinking more holistic, inclusive and non-discriminatory towards diversity and sustainability of the world. Learning from the project is an excellent input for future endeavours and I greatly appreciate the project TEAM, HARTI and APN for providing this opportunity at such an early stage in my academic career”.

Amal Dissanayake, Research Officer, Hector Kobbekaduwa Agrarian Research and Training Institute Colombo.

9. References

http://www.apnsustanabilityknowledge.com/

Weerakkody, P.R., Dunusinghe, P.M., & Gunawardena, P. (2017). *Proceedings of the Workshop: Assessing Agricultural Sustainability*. Hector Kobbekaduwa Agrarian Research and Training Institute, Colombo, Sri Lanka.

10. Acknowledgments

Director HARTI as the project grantee and the project leader with the collaborators acknowledge the Asia-Pacific Network for Global Change Research (APN) for providing the financial assistance to undertake the project titled “Capacity Development of Research-Policy-Technology Personnel in Sri Lanka on Global Change and Sustainability”. Sincere gratitude is dedicated to resource personnel, the Ministry of Agriculture and the Provincial and District Directors of Agriculture of the SEDZSL, for the cooperation throughout. Special mention should be made of all the field officers and farmers who spent their precious time on us to bring the project to a successful end. A note of appreciation for HARTI staffs who assisted in numerous ways to complete this project as scheduled.

Table of Contents

1. Introduction

The agricultural policy of Sri Lanka is principally intended to achieve sustainable development of agriculture in the country. The said policy symbolizes the 'awareness' of policymakers on the concept of sustainable development through the strategies chosen to achieve the same. Even though the rural agrarian sector significantly contributes to produce a large part of the food requirement of the nation, there is an array of sector specific calamities showing the overall dilemma prevailing in this sector. Social factors including the aging of the farm population and youth drifting away from farming, poverty, malnutrition and poor living conditions, life threatening health hazards such as Chronic Kidney Disease of Unknown aetiology (CKDU) underscore the poor social identity of these farming communities. The encroachment and clearing of forests for agriculture, the indiscriminate use of pesticides, the excessive use of subsidized fertilizers to compensate the declining productivity and the overuse of water resources have threatened the natural resource base. Changing climatic conditions and pest attacks have largely contributed to perpetuate declining farm productivity at grassroots level, lessening sector growth at national level. The given social, economic and environmental failures exemplify how resource mobilization within the sector has fallen short of its goals thus placing agricultural sustainability at a greater risk.

Though considerable importance is attached to sustainable development of agriculture, agrarian policy formulation process is often steered by economic and/or political interests. Less/lack of integration of environmental and social aspects in policy formulation is largely attributed to poor knowledge of their significance. In this context, enhancing sustainability knowledge among policymakers and effective means of translating the acquired knowledge into practice is vital in sustainable agriculture development. The project titled 'Capacity Development of Agrarian Research-Policy-Technology Personnel in Sri Lanka on Global Change and Sustainability' envisioned to enhance the understanding of policymakers and relevant stakeholders in the country on three-pillar approach for sustainable development and

to provide a scientific input for building capacities among policymakers who have an important stake in the agrarian policy formulation process.

The project was designed to have both research and capacity building components, a strategy for ensuring both generation and dissemination of sustainability knowledge. The research component sought to conduct a research for the construction of sustainability indices for selected FCPSs and to construct composite sustainability indices (CSIs) through integrating social, economic and environmental sustainability indices so constructed. The CSI of a FCPS itself reflects the degree of sustainability of that particular system operated under the given socio-economic and environmental circumstances. The survey was also designed to explore the issues and problems associated with the dimensional level sustainability indices and necessary policy interventions. The capacity building component focused on several key stakeholders; strengthening scientific capacity and developing analytical capabilities of the HARTI academics on sustainability knowledge, developing decision making capacities of policymakers from a sustainable development view point; enhancing skills of field level extension personnel in the study locations to perform as farmer educationists in the field of sustainable agriculture and raising awareness among the farming community on the sustainability issues they face and options for improvement of their own FCPSs.

2. Methodology

The uniqueness of the methodology applied in this project was that it was designed to use research outcome as the input for a series of capacity building efforts at varying levels from national and regional to grassroots level. Thus the project comprised both research and capacity building components and the methodology applied in each component is discussed below.

2.1. HARTI Training Workshop

The initial capacity building exercise envisioned through the project proposal commenced with the conceptual exposure and methodological training that ultimately led to successful completion of the research component by the TEAM. The workshop was held at HARTI from 3-5 August 2016[1] and 40 HARTI academics[2] benefited from the workshop. The project leader and collaborators while providing a comprehensive introduction to APN and its strategic interventions in global change research contributed both directly and through arranging eminent speakers towards enhancing sustainability knowledge among HARTI researchers and building their capacities on social, environmental and economic impact assessment techniques for diverse farming options. The workshop topics included: (a) Concept of sustainability and three-pillar approach for sustainable development; (b) Social dimension of sustainable agriculture development; (c) Integrating social concerns in agrarian policy formulation; (d) Indicators for assessing social impacts of agriculture; (e) Introduction to social life cycle assessment (SLCA) method; (f) Concepts and methods of environmentally friendly farming; (g) Environmental dimensions of sustainable agriculture development; (h) Integrating environmental concerns in agrarian policy formulation; (i) Environmental impacts of agriculture and impact assessment methods; (j) Environmental life cycle assessment (ELCA) method; (k)

[1] Appendix 1 - Agenda of the HARTI Training Workshop
[2] Appendix 2 - List of Participants of HARTI Training Workshop

Economic impacts of agriculture and impact assessment methods; (l) Cost-benefit analysis; (m) Choice of indicators for assessing economic impacts of farming; (n) Construction of indices of sustainability on social, economic and environmental dimensions of agriculture; and (o) Construction of composite indices of agricultural sustainability by integrating above three dimensions.[3] Apart from this, at the end of the workshop, the participants provided not only feedbacks of how beneficial the workshop was for their academic involvements but also suggested that the emphasis should be on the social, economic and environmental dimensions in agrarian policy formulation.[4] Subsequent discussions between the TEAM, project leader and collaborators led to identify and workout an appropriate sustainability assessment framework (SAF) for the research component.

The proceedings of the workshop published are accessible at the project website; http://www.apnsustanabilityknowledge.com and at HARTI web site; www.harti.gov.lk

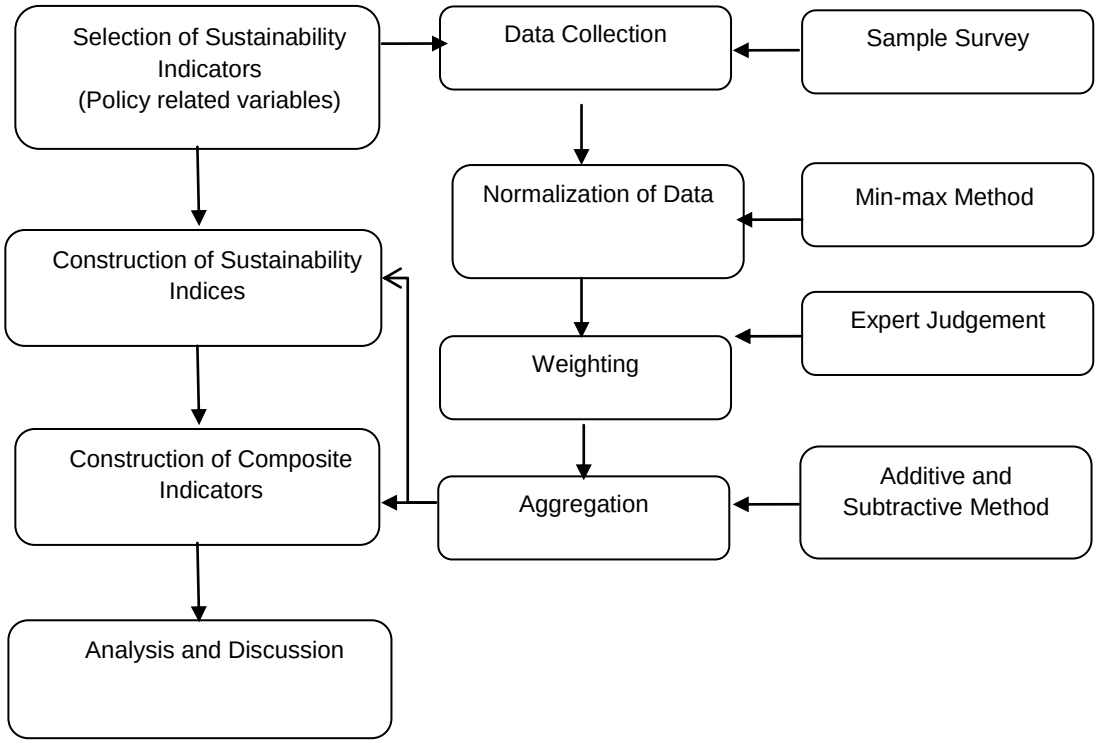
2.2. The Research Component

The unique feature with the methodology used in this exercise was its originality that it led to provide a practicable definition for agricultural sustainability. The SAF substantively captured local farming circumstances led to assess sustainability indices based on first-hand information and introduces them as workable policy tools. The TEAM gathered primary information from prominent FCPSs through a field survey undertaken in the SSEDSL.[5] Located in the territory of low country dry zone, it comprises five agro-ecological regions (AERs) namely; DL 1a, DL 1b, DL 2a, DL 2b and DL 5 as demarcated in Map 1. SEDZSL covers virtually all that territory that lies on the east of the *Walawe* basin, south and south east of the *Haputale* escarpment and east of the *Passara* hills. It is a low lying area comprising of certain parts of three administrative districts in the country; namely *Hambantota, Moneragala* and *Ampara* districts with ample diversity in land use systems and food crop production.[6]

The TEAM involved in the study of prominent FCPSs; maize, groundnut, green gram, red onion and sugar cane. As trained during the training workshop, they developed structured questionnaires for data collection from a representative sample of farmers from each FCPS in the study location. In addition to the collection of socio-demographic aspects of the sample farmers, primary data required for the entire analysis was gathered in reference to 2015/16 *maha* season; the rainy season experienced in the study location from November to February in which plenty of food crops are produced in uplands under rain-fed conditions. The analysis in principle focused on the construction of dimensional and composite indices of sustainability for each FCPS based on the indicators cautiously selected where guidance was sought through life cycle approach and the stakeholder approach. The analytical framework illustrated in Figure 1 and Table 2 provides details of indicators selected for the construction of indices with respective variables, measuring units, method of aggregation (additive or subtractive) and weights assigned.

[3] Appendix 3: A Summary of HARTI Training Workshop
[4] Appendix 4: Training Evaluation Format
[5] Appendix 5: Map of SEDZSL
[6] Appendix 6: Land Use Map of SEDZSL

Figure 1. Analytical Framework



Prior to analysis, both normalization (Equation 1) and weighting techniques were employed. Among the dimensional indices (Equation 2) were social sustainability index (SOSI), economic sustainability index (ECSI) and environmental sustainability index (ENSI) with a final composite index (CSI) (Equation 3) constructed by aggregating dimensional indices.

$$Normalization\ (NX_m) = \frac{(X_i - min_m(X_i))}{(max_m(X_i) - min_m(X_i)}$$ Equation 1

$$Diamensional\ Sustainability\ Index = \frac{\sum_{i=k=1}^{nk} W_k X_{ki}}{\sum_{k=1}^{k} W_k}$$ Equation 2

$$Composite\ Sustainability\ Index = \frac{W_{SOSI}SOSI_i + W_{ENSI}ENSI_i + W_{ECSI}ECSI_i}{W_{SOSI} + W_{ENSI} + W_{ECSI}}$$ Equation3

Table 1. Indicators used to construct Sustainability Indicators

Social Indicators	Variables	Measuring units	Aggregation	Weights
Employment generation	Total labour usage (Family and hired)	Man days/acre	(+)	0.2
As a source of income	Net return to family labour	Rs/man day	(+)	0.3
Competitiveness	Mean difference between breakeven price & actual price	Rs/kg	(+)	0.3
Input availability	seed quality	5 - Very good 4 - Good 3 - Acceptable 2 - Poor 1 - Very poor	(+)	0.2
Social Sustainability Index (SOSI)				**0.3**
Environmental Indicators	**Variables**	**Measuring units**	**Aggregation**	**Weights**
Application of Chemical Fertilizers	Severity of chemical fertilizer application	Rs/acre	(-)	0.4
Application of Pesticides	Severity of Pesticide application	Rs/acre	(-)	0.4
Depletion of land resources	Severity of soil erosion	5 - Very severe 4 - Severe 3 - Moderate 2 - less 1 - No	(-)	0.2
Environmental Sustainability Index (ENSI)				**0.3**
Economic Indicators	**Variables**	**Measuring units**	**Aggregation**	**Weights**
Profit	Net farm income	Rs/acre	(+)	0.4
Crop Productivity	Over time trend of productivity change	Kg/ac (mean of last 3 years)	(+)	0.4
Relative Economic Importance of cultivating the crop	Contribution to total family income from crop production	% per crop cycle	(+)	0.2
Economic Sustainability Index (ECSI)				**0.4**

2.3. The Science-Policy Forum

A science-policy dialogue was organized at HARTI on 20 July, 2017 with an aim to share the research findings by the research team. Inaugurated with the participation of both scientists and policymakers representing different ministries, departments and institutions majoring in agriculture and related fields,[7] the forum was arranged with a technical session and a policy discussion.[8] The team shared the research findings at the technical session co-chaired by two project collaborators whilst the project leader presented the synthesis of findings. Dr. W. M. W. Weerakoon, Additional Secretary to the Ministry of Agriculture on behalf of the Secretary to the State Ministry of Agriculture, chaired the policy discussion. It was an interactive discussion between research scientists and policymakers around the usefulness of the scientific input provided and related policy implications sought through this academic exercise. Overall, the science-policy dialogue helped enhance the capacities of agrarian policymakers through sharing project findings, lessons learned and recommendations to ensure integrating social and environmental concerns, in addition to economic concerns, into agrarian policy formulation process. The need for modernizing the farming sector, combating impacts of climate change, overcoming the threats of socio-cultural changes while ensuring food security of the nation through recent food production drives were received the particular attention of the audience. There was also ample opportunity for further clarifications and sharing of relevant information. Highlights of the science-policy dialogue are available at http://www.apnsustanabilityknowledge.com.

2.4. Training of Trainers (TOT) Programmes

The TOT programmes for agricultural extension personnel at their respective locations were primarily designed to train these officers to conduct subsequent farmer training programs afterwards. Three TOTs were organized at local venues in *Ampara, Moneragala* and *Hambantota* districts considering the cost-effectiveness of conducting the programmes and convenience of the participants. Exceeding the project targets (30 officers); the TOTs successfully concluded having trained 56 extension personnel on their demand.[9] The trainees were mainly agricultural instructors who act as farmer educationists at the grassroots level and other potential partners who could support and encourage bottom-up policy formulation process for instance, AIs can collect data pertaining to all aspects of FCPSs, maintain and provide them for policy making purposes on need base. AIs also will involve in dissemination good agricultural practices to the farmers with the knowledge gained through the TOT programmes. The first day of the TOTs was structured to enhance the knowledge of trainees on sustainability concepts and their links to farming operations and circumstances in their respective locations with possible measures to overcome sustainability issues based on theoretical knowledge as well as practical experience gained through the research component.[10] The second day was allocated for group work to design the content of the upcoming farmer training programmes based on what they learnt in TOTs and their own experience under the supervision of the TEAM. On the successful completion of the assignment, the TOTs were concluded and evaluated by the participants[11]. All participants were awarded a certificate of participation as an acknowledgement[12].

[7] Appendix 7: List of Participants in Science-Policy Dialogue
[8] Appendix 8: Agenda of the Science-Policy Dialogue
[9] Appendix 9: Lists of Participants in TOTs
[10] Appendix 10: Agenda of the TOT Programmes
[11] Appendix 11: Evaluation Form for TOTs
[12] Appendix 12: Certificate of Participation in TOTs

2.5. Easy-to-Learn Sessions

Easy-to-Learn (ETL) sessions were conducted by the trained extension officers to educate representative farmer leaders at their respective farming locations under the supervision of the TEAM. The programme curriculum and teaching material were developed in an 'easy-to-learn' manner that ensures both clarity of information dissemination and easy understanding for trainees. Practical farming problems and awareness raising on the science of climate change and its impact on agriculture with appropriate cultural measures were addressed in the ETL content. Of the trainees benefited through TOTs, 30 officers were selected and committedly involved in conducting three ETLs each participated by ten farmers or more with a total exceeding 30 trainees. Subsequently, over 900 farmer representatives were benefited from 30 ETLs conducted at study locations. The outcome of the research component and the solutions for sustainability issues were discussed at the ETLs under the form of interactive sessions between farmers, researchers and extension officers.

3. Results & Discussion

Results and discussion is organized by project activities.

3.1.HARTI Training Workshop

As envisioned, the TEAM performed well in the proposed research component aided by the wide-ranging knowledge gained on social, environmental and economic dimension of agriculture, its link to global change and sustainability and enhanced capacity on dimensional impact assessment methods of FCPSs. The workshop provided a greater input to the TEAM owing to enhanced knowledge and skills required for designing the questionnaires for data collection, performing analytical techniques and constructing sustainability indices by taking social, economic and environmental dimensions of food crop production into account.

The participants had rated the overall achievement of workshop objectives; excellent - 14%, good - 77%, and average - 9%. Relevancy of the content for academic work had been rated; excellent - 18%, good - 68%, and average - 14%. Organization of workshop was rated; excellent - 32%, good - 64% and average - 4%. Overall, the results indicate that the achievement is satisfactory and effective.

The final evaluation further confirmed that the workshop has contributed to improve the sustainability knowledge among the audience in general, and the TEAM in particular. Both social and economic aspects were given due attention at the design stage as it is well known that the economic dimension is frequently encountered in scientific research and thus is more familiar among researchers. The evaluation also saw that, despite the stimulation of interest in the area of sustainability, immediate application of sustainability knowledge in their academic work is not as expected. Notably, participants have become well aware of different dimensions of sustainability, which was the prime objective of the workshop. Weighting proposed by participants at the final evaluation for social, economic and environmental dimensions for decision-making at different levels was indicative of the achievement of workshop objectives.

3.2. Research Results

Overall Sustainability of Food Crop Production Systems

The research component of the project was principally designed to construct overall (composite sustainability index- CSI) and dimensional sustainability indices namely social sustainability index (SOSI), economic sustainability index (ECSI) and environmental sustainability index (ENSI) for FCPSs operating at the study location. The proceeding discussion brings an analysis of three priority food crops of the present food production national programme to demonstrate the usefulness of sustainability indices as supportive policymaking tools in the move to achieve food production targets. In regard to sustainability indices, the higher the index value the higher the social and economic performances, however opposite occurs in environmental performances (see Table 2).

Table 2. Sustainability Indices of Selected Food Crop Production Systems

Crop	SOSI	ENSI	ECSI	CSI
Maize	0.517***	-0.173***	0.226***	0.194***
Groundnut	0.529***	-0.111	0.194***	0.203***
Green gram	0.508***	-0.117*	0.109*	0.161***

***, ** and * denote the significance level of 1%, 5% and 10% respectively.
Source: own calculation, 2017

As indicated by dimensional and composite index values of FCPSs (see Table 2), groundnut demonstrates the best overall performance (CSI = 0.203) owing to encouraging social performances (0.529) followed by relatively high economic facets (0.194) compared to maize and green gram. Though it seems to be increasingly environmental friendly, the environmental performances of groundnut are statistically insignificant (-0.111) which represents high variability in contributing variables.

Despite the lowest environmental performances (-0.173), maize performs the best in economic terms (0.226). It is as popular as groundnut among the farming community but it is also the most environmentally damaging crop compared to the rest of crops both are legumes in which fertilisation is optional. Nevertheless, environmental pollution is substantial in green gram (-0.117), the poorest among crops in economic terms (0.109). Thus, green gram falls into the least sustainable category (CSI= 0.161) despite its higher social performances similar to other crops.

In summary, the results indicated in Table 2, in general, help understand the relative sustainability of FCPSs operated within more or less similar agro-ecological circumstances. The analysis also provides guidance towards required policy interventions that ensure sustainable growth in food crop production as envisioned in the recent food production drive.

Dimensional Sustainability of Food Crop Production Systems

Further analysis of data sheds light on decisive factors of dimensional and overall performances of FCPSs under consideration. The data in Table 3 illustrates the behaviour of social variables which led to construct SSIs with their level of significance.

Table 3. Average Values of Social Sustainability Indices

Crop	Total labor use (md/ac)	Net return to family labor (Rs/md)	Mean difference between farm gate price and breakeven price (Rs/kg)	Seed quality rate
Maize	43*	511	16	3.05***
Groundnut	123	217	72	2.90***
Green gram	68	35	20	2.97***

***, ** and * denote the significance level of 1%, 5% and 10% respectively.
Source: own calculation, 2017

Seed quality is the significantly decisive variable in SOSI. In maize, seed quality is acceptable to the farmers against its poor quality in comparison with groundnut and green gram which largely depend on self-produced seeds with less assurance of the quality. Nevertheless, maize is a well-established crop largely owing to the abundant availability of imported hybrid maize seeds through contract arrangements prevailing in the study location. Correlation analysis (see Table 6) further confirms that seed quality is positively correlated with SOSI whilst significantly contributing to CSI as well. This comparative analysis helps understand where policy interventions are necessary in regard to assure availability of quality seeds.

The data implicates that there exists higher erraticism in other variables other than labour use in maize cultivation, a well-established commercial crop cultivated using a substantively fixed package of manual and mechanized operations. Yet both groundnut and green gram are associated with the heavy use of labour, both family and exchanged leading to high variability as denoted by insignificance values in Table 3. Apart from this, data provides evidence on high fluctuations in net return, farm gate prices, and breakeven prices. Though insignificant, maize fetches a higher return if family labour is invested. The given comparative analysis further reveals areas where policy directives are needed if food production targets are to be achieved.

Likewise, data pertaining to ENSI (see Table 4), ECSI (see Table 5) and correlation analysis (see Table 6) reveals the ground reality of FCPSs. For instance, severe fertilizer pollution through maize, pesticide pollution through both maize and groundnut and more or less equal contribution to soil degradation from all crops in environmental terms (see Table 4). Further, how productivity is significant though the average productivity is less in comparison to the potential, significant economic importance of maize production as a source of income which accounts for 38% of the total family income, high variability in returns from all crops are apparent from the data in Table 4. Data in Table 6 further support the above analysis.

An in-depth analysis of ground level data provides the evidence of increased application of chemical fertilizer in maize cultivation to derive the full potential of hybrid vigour and abundant availability of fertilizer with the dealers promoting hybrid maize cultivation with or without forward contracts encouraged farmers to apply chemical fertilizer and pesticides. All three

crops contribute to pesticide pollution whereas both maize and green gram reports the cost of pesticides exceeding the value of Rs. 60000/acre, especially for weed control. The recent ban on a popular weedicide has caused an increase in the cost of pesticide in two ways; scarcity of weedicides in the open market has created an artificial demand which led to an increase in price, and the other available weedicides are less effective so that farmers use more and repeatedly. One of the key problems associated with the seasonal food crop production is the difficulty in controlling weeds with the less effective weedicides currently available. In regard to soil erosion, the rank data shows that lands occupied by the crops significantly suffer from soil fertility depletion. Flat and fairly undulating lands used for the cultivation of these crops at the study location are mostly encroached lands with no or less soil conservation measures. This is reflected by the data which depict below average performance in regard to rate of soil erosion and less productivity performances (see Table 5).

Table 4. Average Values of Environmental Sustainability Indices

Crop	Severity of Fertilizer Pollution (Rs/ac)	Severity of Pesticide Pollution (Rs/ac)	Rate of Soil Erosion
Maize	7693***	2945***	2.310***
Groundnut	2366	2735*	2.313***
Green gram	1355	2302	2.315***

***, ** and * denote the significance level of 1%, 5% and 10% respectively

Source: own calculation, 2017

Table 5. Average Values of Economic Sustainability Indices

Crop	Profitability	Productivity	Economic importance
Maize	25931	1606***	38*
Groundnut	26035	583***	45
Green gram	6396	374***	21

***, ** and * denote the significance level of 1%, 5% and 10% respectively

Source: own calculation, 2017

Accordingly, the analysis undertaken based on the sustainability assessment framework proposed in this project could be further elaborated to identify the degree of sustainability of each FCPS along with the policy matrix (see Table 7), related problems and to derive appropriate policy interventions. A detailed analysis of the data is/will be available in the featured article submitted to APN Science Bulletin 2017 and in the forthcoming HARTI research publications.

Table 6. Correlation Analysis for Groundnut

Variables	SSI	ENSI	ECSI	CSI
Total labor use	0.3512*			-0.0431
Net return to family labor	0.4357*			0.5198*
Mean difference between farm gate price and breakeven price	0.4830*			0.4625*
Seed quality rate	0.7299*			0.3665*
Severity of Fertilizer Pollution		0.0712		0.1368
Severity of Pesticide Pollution		-0.7984*		-0.4570*
Rate of Soil Erosion		-0.7163*		-0.5147*
Profitability			0.6109*	0.6168*
Productivity			0.4573*	0.5042*
Economic importance			0.7926*	0.5126*
SOSI				0.5904*
ENSI				0.6249*
ECSI				0.8146*
***significant at 5% level**				

Table 7. Policy Matrix

Index Value	Degree of Sustainability	SOSI	ECSI	ENSI	CSI
1	Highest				
0.80-0.99	Higher				
0.60-0.79	Above Average				
0.40-0.59	Average	All			
0.20-0.39	Below Average		Maize		GN
>0 -0.19	Least		GG, GN	All	Maize, GG

Source: own construction

3.3. TOT Programmes

The exposure received through TOT programs became a unique experience for the trained extension officers - as the program itself was a reflection of the current circumstances of farming operations in the area. They played an important role in the field survey both as facilitators and organizers and thereby they were enthusiastic to know the research findings and address the problems identified through the field survey as it was an essential part of the mandatory service of their own in assuring the prosperity of farming communities. Therefore, as agents of technology transfer at the grassroots level, trainees were highly satisfied with the application of knowledge generated through surveys in their respective locations and which they perceived as an effective mean of knowledge sharing.

Trainees showed an increased interest on the conceptual elaboration presented at the TOTs in relation to the unfavourable weather pattern and climatic variations, greenhouse effect and its link to global warming and possible effects and impacts on agriculture. Trainees sought several clarifications to practical problems they face as extension personnel. to name a few, the viability of protected agriculture in drier parts of the country, the use of shading material with different colours with varying thicknesses under varying weather conditions are some of those interesting questions that depicted information needs of the extension staffs. More importantly, the trainees were enthusiastic to learn about various approaches and methodologies which were employed in the research component like farming systems research, stakeholder analysis and lifecycle thinking which entirely became novel experiences to them. The trainees stressed the fact that integrating such newer knowledge into farmer training programmes will provide them with an ample opportunity to share the same with the farming community when and where appropriate. TOTs also provided them with an opportunity for clarifying doubts they had come across regarding the indicators and variables used in capturing agricultural sustainability. The group exercise for weighting three dimensions of sustainability took a form of a brainstorming session among the trainees.

It is noteworthy that the research findings shared with the trainees were more realistic and accurate, and led to highlighting root causes for some burning issues at the field level. For instance, the high incidence of collar rot disease, the poor storage facilities for seeds even for shorter period, the lack of farmer federations, the problem with price bidding and the unavailability of a proper marketing channel, the lack of subsidies and crop insurance with particular reference to ground production. As per the closing evaluation, the overall feedback is positive and encouraging; participants had acquired adequate knowledge; time allocation was adequate; the programme was well structured; expected aims were reached. The trainings substantially helped participants in performing their duties and applying the obtained knowledge in the field operations. They were also enthusiastic to comment on a wide range of knowledge and training needs required to perform their duties; information on market prices, agri-insurance, the current situation of other countries, achieving sustainable agriculture development, weather related data, technological interventions for farming, organic agriculture, integrated pest management, agricultural export and integrated plant nutrition management techniques and practical field visits. Appendix 12 presents the closing evaluation results.

3.4. Easy-to-Learn Sessions

The immediate objective of organizing the ETL programmes was to disseminate research findings to the end users, farmers through sharing the research findings with the farmer representatives in respective farming localities. ETLs were successfully concluded as scheduled whilst exceeding the targets through sharing information with over 900 farmer representatives. The participants were satisfied with the sessions for the convenience, organizing and the content with particular reference to the means of conducting the programme which made them aware of the science of sustainable agriculture, climate change and its impacts on their farming operations through simplified explanations that suits their capacity based on research findings and examples drawn from their own farming operations. Training material developed in local languages and made available to the participants became highly supportive for them to realize sustainability concepts and how they are linked to changes both globally and locally. Reflections by the participants led to the understanding that they left the sessions with changed attitudes.

4. Conclusions

The overall project contributed towards the sustainable development of agriculture in numerous means commencing from the training of HARTI researchers which improved their knowledge and skills on assessing agricultural sustainability and a fruitful science-policy dialogue to training of officers and farmer representatives. More importantly, researchers were able to invest their experience in feeding the policy formulation process. In addition to the enhanced sustainability knowledge, skills gained through the training have made the researchers more competent in involving the impact assessment of various governmental programmes and thereby supporting those efforts to be in the correct track towards sustainable development.

The field research generated a wealth of information on prominent FCPSs in the SEDZSL and provided an in-depth understanding about different dimensions of agricultural sustainability, their interrelations and potential variations within and between farming options operated under similar agro-ecological conditions. Moreover, the importance of such information in demarcating social, environmental and economic limits of future agricultural operations in the study area is enormous. The most vital outcome of the research component entails in the ability to direct senior level policymakers towards using quantitative measures as decision tools in agrarian policy formulation process within the context of sustainable agriculture development.

Through the science-policy dialogue, the policymakers were increasingly informed about the concepts and the link between global change and sustainability and to which degree the present farming operations are sustainable. It is definite that the policymakers will effectively respond to sustainability issues in the agrarian sector of the country through formulating appropriate policies and deploying workable strategies and approaches towards agrarian development. This scientific input offered will result in planning and mobilization of resources more responsibly and accountably not only in economic terms but also in social and environmental terms.

The TOTs strongly established the fact that extension officers were sufficiently equipped with sustainability knowledge and means to apply the same to day-to-day events at grassroots level. The trained officers are of the opinion that they should actively engage in the provision of sufficient feedback towards bottom-up planning against the top-down approach commonly employed. The TOTs have also encouraged them to collect and maintain quality databases of their own on dimensional aspects of farming options for informed decision making at the respective farming locations. The TOTs offered a valuable scientific input to the agricultural extension service accompanied by a high potential for integrating into the formal TOT schedule of the Department of Agriculture in Sri Lanka.

The trained extension officers are enthusiastic to share their gained knowledge and skills with the grassroots level farmer representatives who provide a substantial contribution to information dissemination. The diffusion of sustainable thinking all the way down to the user level bridges the technical knowledge gap of sustainable development of agrarian sector of the country.

5. Future directions

The sustainability assessment framework invented through this project needs to be further developed, validated and introduced for a widespread use in agrarian policymaking spheres. The project findings are required to be shared with the Department of Agriculture for further development of extension curriculum around the concepts of sustainability while addressing related issues and problems. The HARTI and other stakeholders are responsible for providing the necessary guidance to the Ministry of Agriculture through the development of practical programmes in achieving production targets set through the current food production national programme in implementation.

References

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List of Appendices

Appendix 1: Agenda of HARTI Training Workshop

"Assessing Agricultural Sustainability"
3rd – 5th August 2016

Day 1: Inaugural Session
Session Coordinator: Ms. Renuka Weerakkody, Project Leader

8.30am	Registration of Participants
9.00am	Lighting the Traditional Oil Lamp
9.05am	Welcome Address by Mr. Haputhanthri Dharmasena, Director, HARTI
9.10am	Objectives of Workshop by Mr. J. K. M. D. Chandrasiri, Additional Director, HARTI
9.15am	An Overview of the Capacity Development Project Funded by the Asia-Pacific Network for Global Change Research (APN) by Ms. Renuka Weerakkody, Project Leader
9.25am	An Overview of the Asia-Pacific Network for Global Change Research by Mr. Anura Jayathilaka, Director (Environmental Pollution and Chemical Control), Ministry of Mahaweli Development and Environment
9.35am	The Role of Scientific Planning Group to APN by Mr. Lalith Chandrapala, Director General, Department of Meteorology
9.45am	Vote of Thanks by Ms. Sharmini K. Kumara, Workshop Coordinator
9.50am	TEA

Day 1: Technical Session I: Agricultural Sustainability: Concepts Approaches for Assessment and Experiences
Session Coordinator: Ms. Renuka Weerakkody, Project Leader

10.00am	"Concepts of Sustainability" Ms. Renuka Weerakkody, Agricultural Resources Management Division, HARTI
10.20am	"An Introduction to Knowledge Integration in Environmental Management" Mr. Sidath Bandara, Environmental and Water Resources Management Divisions, HARTI
10.40am	Participants' Insights
11.30am	"Experience in Promotion of Organic Fertilizer Production and Utilization in Sri Lanka" Dr. J. D. H. Wijewardene, Director /SLCARP
12.30pm	LUNCH

Day 1: Technical Session II: Environmental Impacts of Agriculture
Session Coordinator: Dr. Prasanthi Gunawardena, Project Collaborator

01.30pm	"Environmental Impacts of Agriculture" Dr. Prasanthi Gunawardena, Department of Forestry and Environmental Science, University of Sri Jayewardenepura
02.30pm	TEA
02.40pm	"Application of Environmental Valuation Methods" by Dr. Jagath Edirisinghe, Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka
03.30pm	Participants' Insights
04.30pm	Documentary

Day 2: Technical Session III: Assessing Environmental Impacts and Integrating Environmental Concerns in Agrarian Research and Policy Formulation **Session Coordinator: Dr. Prasanthi Gunawardena, Collaborator, APN/HARTI Joint Project**	
08.30am	"Need for an Integrated Agricultural Policy Framework –Sri Lankan Context" Dr. D. P. S. Chandrakumara, Dean, Faculty of Humanities and Social Sciences University of Sri Jayewardenepura
10.00am	TEA
10.10am	"Assessing Environmental Impacts of Agriculture and the Need to Integrate within Decision Making" Dr. Parakrama Weligamage Department of Agricultural Economics and Business Management, University of Peradeniya
12.30pm	LUNCH
Day 2: Technical Session IV: Integrating Social Concerns in Agrarian Research and Policy Formulation **Session Coordinator: Ms. Renuka Weerakkody, Project Leader, APN/HARTI Joint Project**	
01.30pm	"Choice of Indicators for Assessing Agricultural Sustainability" Ms. Renuka Weerakkody, Agricultural Resources Management Division, HARTI
02.00pm	"Importance of Application of Crop Growth Models in the Agriculture Sector in Sri Lanka" Mr. Shantha Hewage, Environmental and Water Resources Management Division, HARTI
02.20pm	Participants' Insights
02.30pm	TEA
02.40pm	"Lifecycle Assessment" Ms. Renuka Weerakkody, Agricultural Resources Management Division, HARTI
03.00pm	Participants' Insights
03.30pm	"Social Lifecycle Assessment Method" Ms. Renuka Weerakkody, Agricultural Resources Management Division, HARTI
Day 3: Technical Session V: Construction of Indices of Agricultural Sustainability **Session Coordinator: Dr. P.M. Dunusinghe, Collaborator, APN/HARTI Joint Project**	
09.00am	"Economic Impacts of Agriculture and Economic Impact Assessment Methods" Dr. P. M. Dunusinghe, Department of Economics, University of Colombo
10.00am	TEA
10.10am	"Choice of Indicators for Assessing Economic Impacts of Agriculture" Dr. P. M. Dunusinghe, Department of Economics, University of Colombo
12.30pm	LUNCH
Day 3: Technical Session VI: Construction of Indices of Sustainability **Session Coordinator: Dr. P.M. Dunusinghe, Collaborator, APN/HARTI Joint Project**	
01.30pm	"Construction of Indices of Sustainability for Social, Economic and Environmental Dimensions of Agriculture" Dr. P. M. Dunusinghe, Department of Economics, University of Colombo
03.00pm	TEA
03.10pm	"Construction of Composite Indices of Agricultural Sustainability" Dr. P. M. Dunusinghe, Department of Economics, University of Colombo
04.00pm	Participants' Insights and Evaluation
04.30pm	END OF SESSION

Appendix 2: List of Participants of HARTI Training Workshop

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Appendix 3: A Summary of HARTI Training Workshop

The Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI) organized the training workshop titled 'Assessing Agricultural Sustainability' aiming to train HARTI academics on 3-5 August 2016. Under the project on Capacity Building of Research-Policy-Technology Personnel in Sri Lanka sponsored by the Asia-Pacific Network for Global Change Research (APN), a total of 30 academics from HARTI, mainly researchers and statistical officers, statistical assistants, programme analysts and information and publication officers were trained. The Asia-Pacific Network for Global Change Research (APN) acting focal point Mr. Anura Jayathilaka and Mr. Lalith Chandrapala from the APN's Scientific Planning Group (SPG) Committee participated at the inauguration of the workshop. The project's authorized representative of the grantee, Director/CEO of HARTI Mr. Haputhanthri Dharmasena, and the Additional Director of HARTI Mr. J. K. M. D. Chandrasiri represented the HARTI at the inaugural session. Dr. P. M. Dunusinghe from the University of Colombo and Dr. Prasanthi Gunawardena from the University of Sri Jayewardenepura, both are senior lecturers and project collaborators, attended the workshop as session coordinators cum resource personnel. The Project Leader Ms. Renuka Weerakkody, Research Fellow at HARTI, also functioned as a session coordinator and resource person. Among other resource personnel, Dr. D. P. S. Chandra Kumara, Dean of the Faculty of Humanities and Social Sciences of the University of Sri Jayewardenepura, Dr. Parakrama Weligamage, Senior Lecturer of the University of Peradeniya, Dr. Jagath Edirisinghe, senior lecturer of Wayamba University of Sri Lanka, Dr. J. D. H. Wijewardene, Director of Sri Lanka Council for Agricultural Research Policy, Mr. Shantha Hewage and Mr. Sidath Bandara, both are senior research officers of the Environmental and Water Resources Management Division of HARTI contributed to the workshop while Ms. Sharmini. K. Kumara, Research Associate of HARTI coordinated the entire event with the support from the HARTI research team.

The Workshop was inaugurated on 3rd August 2016 by lighting the traditional oil lamp and on behalf of HARTI Mr. Haputhanthri Dharmasena welcomed the audience and appreciated the organization of the workshop by HARTI researchers, and valued the contribution of APN to initiate a piece of academic exercise on agricultural sustainability. Additional Director Mr. J. K. M. D. Chandrasiri clarified the workshop objectives.

Mr. Anura Jayathilake while providing a brief introduction on the APN to the audience congratulated the HARTI research team to complete the workshop and to undertake the rest of the project activities successfully. Mr. Lalith Chandrapala explained the role of the APN 's SPG Committee and its work in Sri Lanka and worldwide. Ms. Renuka Weerakkdoy briefly outlined the project objectives and the benefits of having the same to the country with the financial assistance by the APN. Valuing the full support of APN to undertake this very timely initiative, Ms. Sharmini K. Kumara appreciated APN's financial support and was thankful to the project collaborators' and resource personnel's commitment in preparing and delivering lectures coming from various parts of the country and all the participants on behalf of the organizing committee.

The first technical session "Agricultural Sustainability: Concepts Approaches for Assessment and Experiences" in the morning 3 August 2016 was coordinated by Ms. Renuka Weerakkody. By opening the session, Ms. Weerakkody detailed out various concepts on sustainability. Mr. Sidath Bandara of Environmental and Water Resources Management

Division, HARTI shared views under the presentation ‘An Introduction to Knowledge Integration in Environmental Management”. Dr. J. D. H. Wijewardene, Director, Sri Lanka Council for Agricultural Research Policy shared his valuable experience of the project he coordinated in Promotion of Organic Fertilizer Production and Utilization in Sri Lanka.

The second technical session titled ‘Environmental Impacts of Agriculture’ was coordinated by Dr. Prasanti Gunawardena. The presentation by Dr. Gunewardene focused on providing an understanding to the audience the basic principles underlying in relation to the inputs of agricultural operations to the environment and whatever goes beyond the sustainable limits as impacts. Continuing the explanation on model of circular economy, environmental impacts of modern agriculture, and calculation of damage to the environment Dr. Gunewardene concluded the presentation by emphasizing the need for incorporating them in national accounting. Dr. Jagath Edirisinghe, spoke about ‘Application of Environmental Valuation Methods” through which the audience ad an exposure to a variety of environmental valuation methods. The session was concluded with this presentation.

Day two of the workshop commenced with the technical session III titled ‘Assessing Environmental Impacts and Integrating Environmental Concerns in Agrarian and Policy Formulation’ coordinated by Dr. Prasanthi Gunawardena. Dr. D. P. S. Chandra Kumara, and Dr. Parakrama Weligamage served as resource personnel in this session. While coordinating the session IV, Ms. Renuka Weerakkody discussed on life cycle approach and Mr. Shantha Hewage sharing views on crop growth models. Technical session V and IV held on day three were entirely allocated to capacitate the trainers on analytical techniques of the research component. Dr. P. M. Dunusinghe served as the resource person. The workshop concluded with a consensus that a novel approach is required to assess the agricultural sustainability of farming operations while emphasizing the need of a sustainability assessment framework.

Inaugural Session

Participants at the HARTI Training Workshop

Dr. Prasanthi Gunawardena, Project Collaborator

Dr. P. M. Dunusinghe, Project Collaborator

Appendix 4: Training Evaluation Format

Workshop on Assessing Agricultural Sustainability

Capacity Development of HARTI Academics
3rd – 5th August 2016 at HARTI

1. Overall assessment of the workshop.

Please mark your response in the appropriate box.

Question	Excellent	Good	Average	Poor	Very Poor
1. Achievement of workshop objectives					
2. Relevancy of the Content of the workshop to developing own academic work					
3. Organization of the workshop					

2. Knowledge and information gained in the context of three aspects of sustainability through participation of this workshop. Please mark the appropriate box using the following rates

1. Yes
2. No 3. To a certain extent

Question	Social pillar	Environmental pillar	Economic pillar
1. Improved my knowledge			
2. Will be useful/applicable in my academic work			
3. Stimulated my interest in learning			
4. Enhanced my awareness of different aspects of sustainability			

3. Assume that you need to quantify the overall sustainability of a farming practice/system where you have to assign weights for three aspects of sustainability. Allocate proportionate weights to three dimensions out of 100 by taking into level of operation of the particular system (national, regional (e.g. South East Dry Zone) and farm level).

Decision Level	Social dimension	Environmental dimension	Economic dimension
National level			
SEDZSL			
Farm level			

4. Please provide additional comments and suggestions on any aspect of the workshop and the proposed study.

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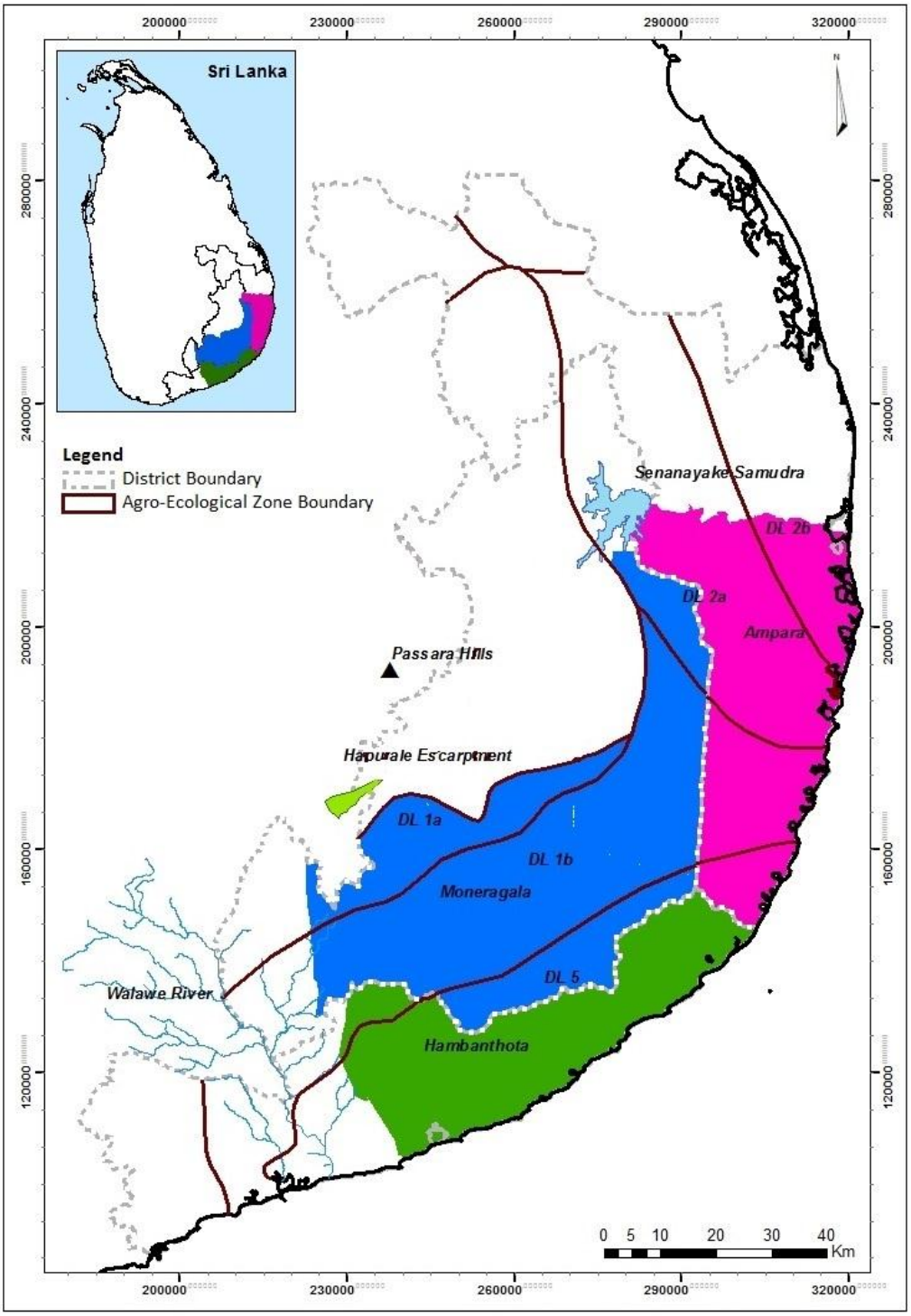
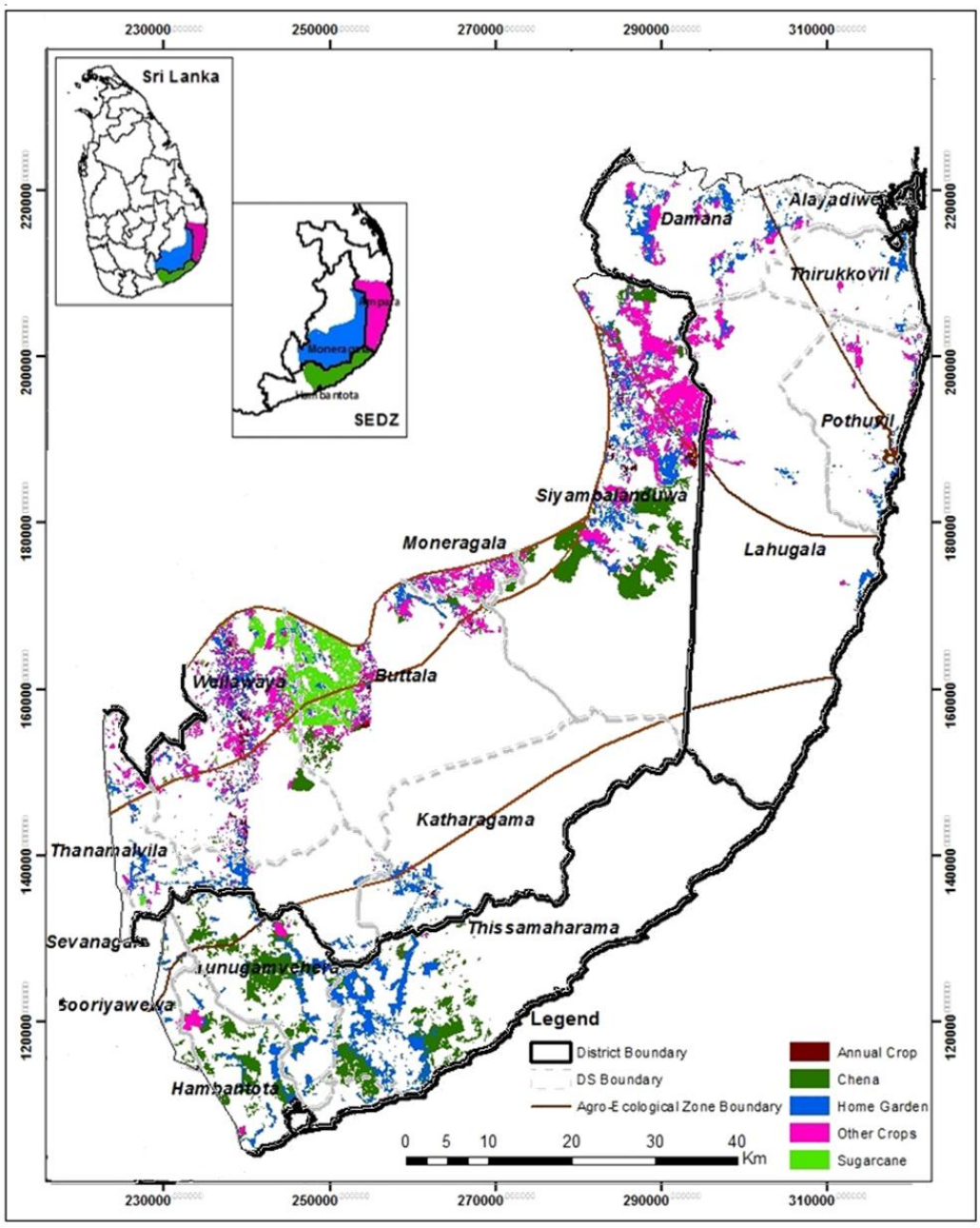
End of Evaluation

Appendix 5: Map of South East Dry Zone of Sri Lanka



Source: Derived by the author based on maps and geo information by the Survey Department of Sri Lanka (2012) and for boundary demarcation by Agrarian Research and Training Institute (1993).

Appendix 6: Land Use Map of South East Dry Zone of Sri Lanka



Source: Derived by the author based on maps and geo information by the Survey Department of Sri Lanka (2012) and for boundary demarcation by Agrarian Research and Training Institute (1993).

Appendix 7: List of Participants of Science-Policy Dialogue

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Special Moments: Science-Policy Dialogue

Appendix 8: Agenda of the Science-policy Dialogue

"Science-Policy Forum" 20th June 2017 Inaugural Session: Coordinator - Ms. Renuka Weerakkody, Project Leader	
08.30am	Registration of Participants
09.00am	Lighting the Traditional Oil Lamp
09.05am	Welcome Address by Mr. Haputhanthri Dharmasena, Director, HARTI
09.10am	An Overview of the Capacity Development Project Funded by Asia Pacific Network for Global Change Research (APN) by Ms. Renuka Weerakkody, Project Leader
09.15am	An Overview of Asia Pacific Network for Global Change Research by Ms. Deepa Liyanage, Director (International Relation), Ministry of Environment
09.20am	The Role of Scientific Planning Group to APN by Mr. K.H.M.S. Premalal, Director, Department of Meteorology
09.25am	Key Note Address by Mr. D. V. Bandulasena, Secretary, State Ministry of Agriculture
09.30am	Vote of Thanks by Ms. Sharmini K. Kumara, Research Associate/HARTI
09.35am	TEA
Technical Session 1 Session Coordinators: Dr. Prasanthi Gunawardena and Dr. P. M. Dunusinghe (Project Collaborators)	
09.45am	Study Objectives and Methods - Ms. Sharmini K. Kumara –Research Associate/HARTI
10.00am	Sustainability of Maize Farming System - Mr. S. Epasinghe –Senior Research Officer/HARTI
10.15am	Sustainability of Sugarcane Farming System - Mr. Prasanna Wijesinghe-Research Officer/HARTI
10.30am	Sustainability of Onion Farming System - Ms. Susila Lurdu –Senior Research Officer/HARTI
10.45am	Sustainability of Groundnut Farming System - Mr. Chinthaka Jayasooriya –Research Officer/HARTI
11.00am	Sustainability of Green Gram Farming System –Ms. Rasika Wijesinghe –Research Officer/HARTI
11.15am	Synthesis – Ms. Renuka Weerakkody –Research Fellow/HARTI
11.45am	Refreshment
Discussion Chair Person: Mr. D. V. Bandulasena, Secretary, State Ministry of Agriculture	
12.00pm	Discussion on Technical Papers
01.00pm	Policy Implications
01.45pm	LUNCH

Appendix 9: List of Participants in TOTs

Name	Designation	District	e-mail
Venue: Pothuvil District Secretariat :2017.07.17-18			
Ms. Mohanaletsumy Jeyarajh	Agriculture Instructor (AI)	Ampara	serojeyarajh@gmail.com
Ms. Tharshiny Ravicha	AI	Ampara	rtharshiny@gmail.com
Mr. N Suntharamoorthy	AI	Ampara	sunthar@yahoo.com
Mr. K Sakinthan	Technical Assistant (TA)	Ampara	ksakinthan@yahoo.com
Mr. M H M Sajaath	AI	Ampara	sajaathai@gmail.com
Mr. S Sithran	AI	Ampara	sithi1981@gmail.com
Mr. S Sayarupan	TA	Ampara	sayarupan@gmail.com
Mr. T W G S Pradeep Kumara	AI	Ampara	jeeva.bmk@gmail.com
Mr. Ramish Yoganathan	AI	Ampara	yoganath003@gmail.com
Mr. K Kanagatharan	Officer-In-Charge (OIC)	Ampara	theivega@gmail.com
Venue : Thellulla Agrarian Services Center 2017.07.17-18			
Mr. W K L A P Nilantha	AI	Moneragala	wknilantha@gmail.com
Mr. D V C Nishans	AI	Moneragala	aiofficewellawaya@gmail.com
Mr. G G N Lakmal Ranaweera	AI	Moneragala	lakmalranaweera531@gmail.com
Mr. A M S S Jayasundara	AI	Moneragala	amsurangajayasundara@gmail.com
Ms. K M Dayani Kanthilatha	AI	Moneragala	-
Mr. K G T Bandara	AI	Moneragala	thilanka@gmail.com
Mr. B M O L Rathnayaka	AI	Moneragala	omanthika@gmail.com
Mr. H M Sujith Priyantha	OIC	Hambanthota	sujithpriyantha119@gmail.com
Mr. H T Indika Srilal	AI	Hambanthota	htiskumara@yahoo.com
Ms. H M S Sewwandi	AI	Moneragala	aiofficewellawaya@gmail.com

Venue: Siyambalanduwa Agrarian Services Center 2017.07.17-18

Mr. W A Maduranga Sandaruwan	TA	Ampara	-
Mr. MM Thushara Sampath	AI	Moneragala	thusara15agri@gmail.com
Mr. B G D Senadeera	AI	Moneragala	dsenadheera19198@gmail.com
Mr. D M N S K Gunasekara	AI	Moneragala	dmnskag@gmail.com
Mr. I L Nowshad	AI	Moneragala	nowshadil@yahoo.com
Mr. H B Devinda	AI	Moneragala	devindapriyadarshana@gmail.com
Mr. C Y Alahakoon	AI	Moneragala	
Mr. H M P P Herath	TA	Ampara	pubuditha89@gmail.com
Mr. J H M N S Jayasundara	TA	Ampara	njayasundara410@gmail.com
Mr. J S P Jayathungama	AI	Ampara	jayathungamaprasanna@gmail.com

TOT Programmes

ETL Programmes

Appendix 10: Agenda of the TOT Programme

Capacity Development of Agrarian Research – Policy –Technology Personnel in Sri Lanka on Global Change & Sustainability 17 – 18 / 07 / 2017

Day 01	**17. 07. 2017**
08.30am	Registration
09.00am	Welcome Address
09.15am	Overview of the Situation of the Agricultural Sector
10.00am	Tea
10.20am	Introduction to the Global Change and Sustainable Agriculture
11.00am	Video Presentation
11.30am	Importance of Adapting Farming System – Stakeholder Approaches for Action Planning
12.30pm	Lunch
01.15pm	HARTI-APN Project Methodology
02.00pm	Sharing Result Findings of HARTI-APN Project
02.45pm	Tea
03.00pm	Verification of Research Findings with Trainees and Discussions
03.45pm	Group work – Incorporating Sustainability Concepts into the General Extension Program
Day 02	18. 07. 2017
09.00am	Group Presentation – Presenting the Group Work
10.00am	Introduction to the 'ETL' Farmer Training Program and its Objectives
10.20am	Tea
10.45am	Developing the Tentative Structure and Content of the ETL Program
11.30am	Group Work – Developing the detailed Module for ETL Program
12.30pm	Lunch
01.15pm	Group Work – Developing the detailed Module for ETL Program Cont.
02.30pm	Tea
02.45pm	Group Presentation – Presenting the Prepared ETL Module
03.45pm	Summing up of Training Program, Concluding Remarks and Evaluation

Appendix11: Evaluation Form for TOTs

TOT programme for Extension Officers on Global Change and Sustainability Farming Systems in South East Dry Zone of Sri Lanka

17-18 July, 2017

Your ideas/opinion on this programme will be highly appreciated and those will be beneficial in improving the quality of the future programmes.

1. As a whole, how far you were able to acquire of knowledge through this programme?
   I. Substantially- 33%
   II. Average- 67%
   III. Lesser – 0%

2. To which extent the programme content was appropriate for achieving the training objectives?
   I. Highly adequate – 53%
   II. Moderate- 47%
   III. Inadequate- 0%

3. Allocation of time for different activities/components in the programme

No.	Activity/component	Too much time allocated	Allocated time was adequate	Allocated time was inadequate
1	Lectures/presentations	5%	95%	0%
2	Discussions/interaction	8%	92%	0%
3	Group exercises/assignments	18%	82%	0%
4	Presentations by trainees	8%	92%	0%

4. As a whole, is the programme worth and aligned to achieve your own objectives?
   I. Highly relevant and worthy-33%
   II. Average- 67%
   III. Less relevant and less worthy- 0%

5. How important/useful was this programme in performing your duty?
   I. Highly useful in performing the duty – 42%
   II. Average- 58%
   III. Slightly useful in performing the duty – 0%
   IV. Not useful in performing the duty- 0%

   If your answer for the above question is “c” or “d” please specify the reasons.

   Not applicable……

6. Is the field application of experience gained through the programme is possible?
   I. Yes -97%
   II. No -3%

If “No” how it could be done as your opinion?
No responses

7. What areas/subject that you suggest to be included in to future programmes?
   1. Collection of data for several seasons
   2. Study about market prices
   3. Practical field visits
   4. Use of agri-insurance
   5. Current situation of other countries
   6. What should be done to achieve sustainable development?
   7. Rainfall and Temperature records of the area
   8. New technologies for cultivation
   9. Organic agriculture
   10. I P M techniques
   11. Export agriculture crops
   12. I P N S techniques

8. What areas/subject that you think less worthy and suggest to remove?
   About indices

   Green revolution

9. Other aspects

	Aspect	Satisfactory	Average	Not satisfactory
I.	Selection of programme venue	57%	43%	0%
II.	Provision of training material	69%	31%	0%
III.	Food	67%	33%	0%

10. Any other suggestions that you think would be useful in improving the quality of the programme.

    This exercise need to be continued to cover all other areas in the province as well.

Appendix 12: Certificates of Participation

Hector Kobbekaduwa
Agrarian Research and
Training Institute

Ministry of Agriculture

APN
ASIA-PACIFIC NETWORK FOR
GLOBAL CHANGE RESEARCH

Certificate of Participation

This is to certify the participation of

Mr / Ms ----------

at the Training of Trainers programme on

"Global Change and Sustainability of Farming Systems in South East Dry Zone of Sri Lanka"

17 – 18 July 2017

organized by

Hector Kobbekaduwa Agrarian Research and Training Institute, Sri Lanka.

sponsored by

Asia-Pacific Network for Global Change Research, Japan

P.R.Weerakkody
Project Leader
Capacity Development of Research-policy-Technology Personal
in Sri Lanka on Global Change and Sustainability Project

Haputhanthri Dharmasena
Director/CEO
Hector Kobbekaduwa Agrarian Research and
Training Institute

Appendix 13: Glossary of Terms

Abbreviation	Explanation
Ac	Acres
AI	Agriculture Instructor
APN	Asia-Pacific Network for Global Change Research
CKDU	Chronic Kidney Disease of Unknown Aetiology
CSI	Composite Sustainability Index
ECSI	Economic Sustainability Index
ENSI	Environmental Sustainability Index
ETL	Easy-to-Learn
FCPS	Food Crop Production Systems
HARTI	Hector Kobbekaduwa Agrarian Research and Training Institute
IPO	Information and Publication Officer
MNPEA	Ministry of National Policies and Economic Affairs
OIC	Officer in Charge
Rs	Rupees
SAF	Sustainability Assessment Framework
SEDZSL	South East Dry Zone of Sri Lanka
SLCA	Social Life Cycle Assessment
SLCARP	Sri Lanka Council for Agricultural Research Policy
SOSI	Social Sustainability Index
TA	Technical Assistant
TEAM	HARTI Research Team
TOT	Training of Trainers