CHAPTER

12

Quenching the Thirst: Open Educational Resources in Support of Drought Mitigation at the International Crops Research Institute for the Semi-Arid Tropics

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Abstract

Drought threatens the economic well-being of hundreds of millions of people and can have a long-term impact on the ecology in many places across the globe. Recent inter-governmental efforts reveal that preparedness is more effective than relief in mitigating drought's impact. To foster drought preparedness amongst rural communities, highly focussed learning and support processes and systems are required. The International Crops Research Institute for the Semi-Arid Tropics established a group of relevant activities under the rubric of the Virtual Academy for the Semi-Arid Tropics. These activities are anchored by a set of practices for learning content creation that are premised on creating and/or using OER in the form of reusable learning objects. The intended groups of learners are rural women whose exposure to the classroom milieu is nil or limited at best. The process of content creation and the support systems for content delivery were designed to accommodate these learners' requirements. This chapter provides a number of the details of this process, then presents and discusses the results. What emerges is a picture of a value-chain wherein OER from highly regarded technical resources is created for the intended audience, iterated for quality and delivered via rural information centres to the learners; these learners become the new contact points for hundreds of farmers to consult as sources of expertise to solve a range of production-related problems in drought situations. Specially developed techniques involving a geographic information system are also briefly described.

Keywords: *drought, semi-arid tropics, vulnerability, preparedness, reusable learning object, reusability, cell phone, videoconference, village information centre, surface water, rainfall, geographic information system, maps*

Introduction

Drought is a phenomenon that affects the economic lives of hundreds of millions of individuals globally. Extended droughts can lead to serious food shortages for human beings and animals and can damage the ecology for long periods of time. Research in drought mitigation and management reveals that preparedness is better than relief and information is the backbone of drought preparedness. International expert opinion favours the development of an arrangement that blends bottom-up flow of data and information with expert advice from the top and communication with the vulnerable groups (UNSO, 2000).

Based on these concepts, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT[1]), globally recognised for its expertise in agriculture in the dry lands of the tropics, launched a project that brought together advances in information and communication technologies for development (ICT4D) with open and distance learning (ODL), with a view to fostering drought preparedness amongst vulnerable human communities. ICRISAT is an international agricultural research centre in the family of the Consultative Group on International Agricultural Research (CGIAR[2]), which is a multilateral consortium of over 50 governments and organisations.

The Concept

The project that ICRISAT set up is called the Virtual Academy for the Semi-Arid Tropics (VASAT[3]) and is focussed on improving drought preparedness at the level of villages. The project was envisioned as a fusion of three strands: aggregating and adapting content from ICRISAT and partners with related and relevant expertise; delivering learning services through computer-based, Internet-connected village information centres arranged in a hub-and-spokes model; and application of ODL methods in content development, management and learning support delivery (Navarro & Balaji, 2003). In the more contemporary jargon of international development research, this was an attempt to build a complete value chain, starting with information producers (e.g., institutions such as ICRISAT) and reaching masses of people effectively. Such a chain involves ICT mediation and use of non-formal, extension-oriented learning processes to build human capacity.

ICRISAT, as a pre-eminent research institute in plant breeding, has been providing improved parental lines of its five mandate crops to various national programmes in 78 countries of Africa and Asia. These programmes, in turn, create their own crop varieties from the parental lines provided and release them to farmers for local cultivation. The number of such releases in different countries was 735 as of 2011 (The Hindu Business Line, 2012). With this perspective, it was not difficult for ICRISAT to envision a programme that generated high-quality, generic learning materials designed for adaptation and reuse or publication in a local context. ICRISAT also has maintained a consistent "open" approach to all the data, information and publications emanating from ICRISAT research and training projects. It is the only international agricultural research organisation

[1] www.icrisat.org
[2] www.cgiar.org
[3] vasat.icrisat.org

globally to adopt a formal policy on open access[4] to all research publications of its scientists through its open access (OA) repository.[5] Consistent with its emphasis on openness, ICRISAT authorised an open educational resources (OER) approach on the VASAT project. In this case study, we focus on the generation and management of learning content as OER in this effort. We shall pay brief attention to their reuse and adaptation in rural learning. The time period covered in this study is primarily 2004–2008, whilst we touch upon one recent development relating to OER and VASAT.[6]

Producing OER in a Granular Way

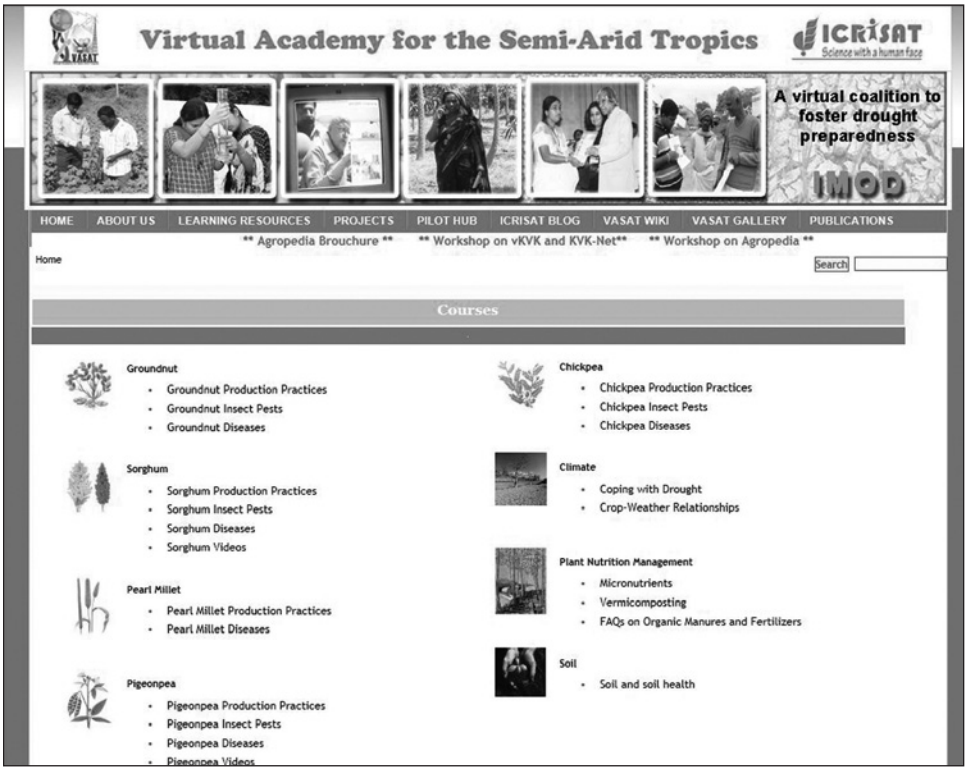
The project developed a reasonable quantum of OER in highly granular form — reusable learning objects (RLOs). ICRISAT designed and built a web-based repository for all the learning materials.[7]

Preliminary studies with the intended users, namely community-based organisations in rural areas and rural and agricultural extension workers, indicated that the materials be designed as granules, each with a possible learning outcome. This model was intended to suit rural learners who had not been exposed to the milieu of a modern classroom or had left it several years earlier. Instructional designers familiar with higher education and training observed that generating viable learning outcomes at that level of granularity would be a challenge, whilst the context demanded doing so. An optimal solution was identified: to develop a lesson plan and position each granule as an element or component in the plan. The relationship between the structure, the plan and the elements — the granules — was thus more visible, enabling the instructional designers to develop the materials.

All learning materials were grouped according to crops (the five mandate crops of ICRISAT), climate and soil. Resources for each of these materials were grouped into modules and each module was a collection of lessons. A lesson, in theory, was an indivisible unit of instruction, an RLO; in practice, it could be used as an information piece as well. The instructional structure thus is: topic → course → module → lesson/RLO. A screenshot of the topics and courses is presented in Figure 13.1. There are nine topics encompassing 22 courses presented as 123 modules, each with an average of four lessons each. Each lesson is estimated to require an average of 30 minutes for field-based learning. All materials are in English.

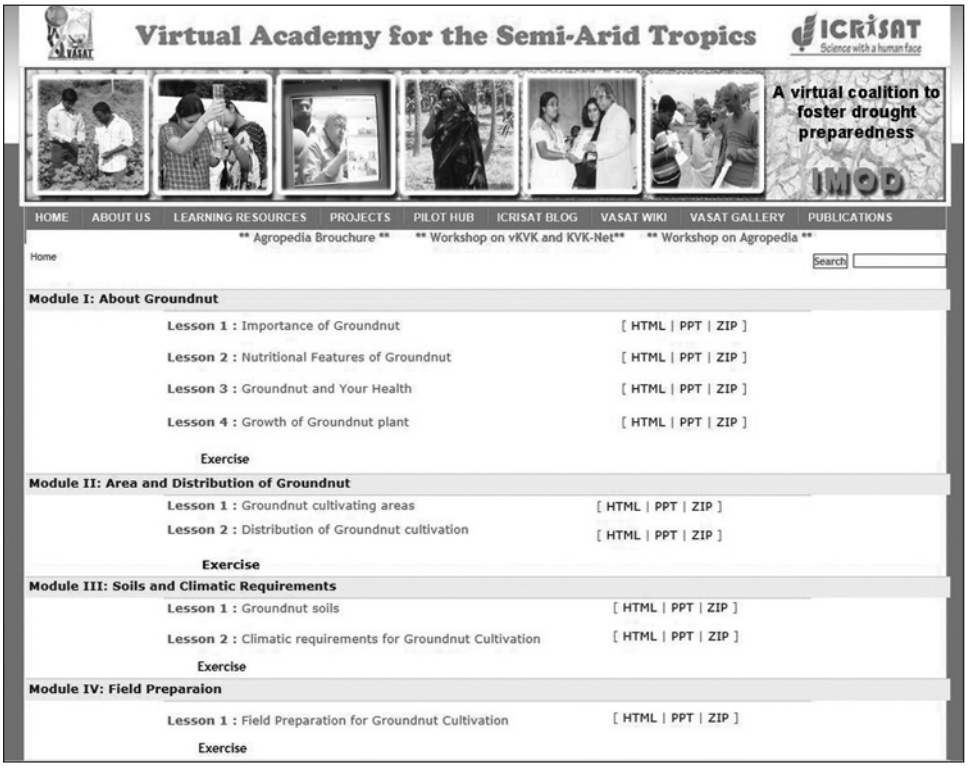
[4] http://roarmap.eprints.org/id/eprint/135
[5] http://oar.icrisat.org
[6] One of the authors (V. Balaji) was on the staff of ICRISAT and served as the co-ordinator of the VASAT project during 2004–2010.
[7] http://vasat.icrisat.org/?q=content/learning-modules-page

Figure 13.1: Screenshot showing VASAT topics and courses



Materials were generated primarily from pre-published training materials and research papers of ICRISAT, and just one full-time expert was involved in compilation and re-authoring. Subject-matter specialists, themselves scientists and researchers of global standing, reviewed and approved the materials for quality. A sizeable number of experts were affiliated with the crop improvement global research theme of ICRISAT, and the rest were affiliated with the agro-ecosystems research theme. For authoring and review, Microsoft PowerPoint (PPT) was used. Although this attracted criticism from the open source software community and from pedagogy experts, the decision was to move ahead with this tool for the simple reason that the barrier to use it was low. PPT was readily accessible in institutions, and most content creators and reviewers were familiar with it. Upon publication on the Web, the PPT format was supplemented with HTML and Flash formats (Figure 13.2). The idea was that making available learning materials in multiple digital file formats would encourage their wider use. The practice of using PPT as an authoring tool and subsequent presentation of the material in Flash format is more widely accepted today, but it was a novelty in 2004 when the work started on this project. Over the period 2004–2008, these materials were revised and updated based on advice from ICRISAT in relevant subjects.

Figure 13.2: Screenshot showing availability of different publication formats (HTML, PPT, ZIP)



Reuse and Adaptation

The modules on pigeonpea, chickpea and groundnut were subsequently adapted and used in preparing training materials for in-service technicians in national agricultural institutions in Eastern Africa. A number of trials were carried out in rural use and the impacts were studied. ICRISAT supported an all-women micro-credit federation, the Adarsha Mahila Samaikhya (AMS), in setting up a computer-based information centre on their rural premises; this centre, in turn, supported a group of six village information centres, which from 2005 onwards also had a PC each. The centre was connected to the Internet first using a low-cost satellite connection and subsequently using landlines and mobile phones (from 2007 onwards). This set-up was used to deliver information to the AMS members and to relay queries from farmers to ICRISAT-based experts to find solutions.

A group of women volunteers, identified by AMS, were trained using the modules. The immediate effect was to improve the quality of farming-related queries they were relaying from the farmers. After the training, women volunteers were able to describe more accurately the field observations from farmers' plots. This improved the experts' own productivity: each query took a shorter time to respond to with a solution, thus enabling experts to handle more queries. A number of trained women were also able to generate their own content for sharing with the farmers in the locality (Figure 13.3). Because of the AMS women's continued interest in learning to solve farming problems, a satellite-based, two-way videoconferencing facility was set up with an in-kind donation from the Indian Space Research

Organisation as part of its Village Resources Centres project (Figure 13.4). This facility enabled an even better learning experience, since women learners could now view things such as disease-affected plant parts or insects that attack plants (Lavanya, Vangala, Sreedhar, Sylvester, & Balaji, 2010).

Figure 13.3: VASAT learning content in Telugu language, adapted by the user organisation

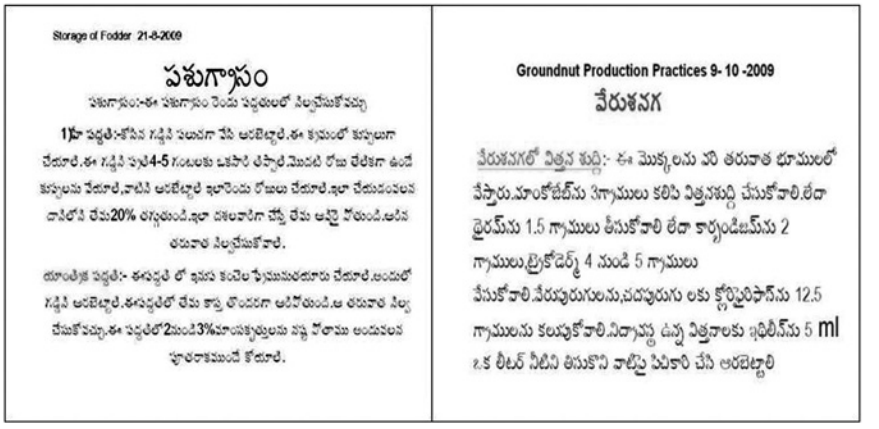
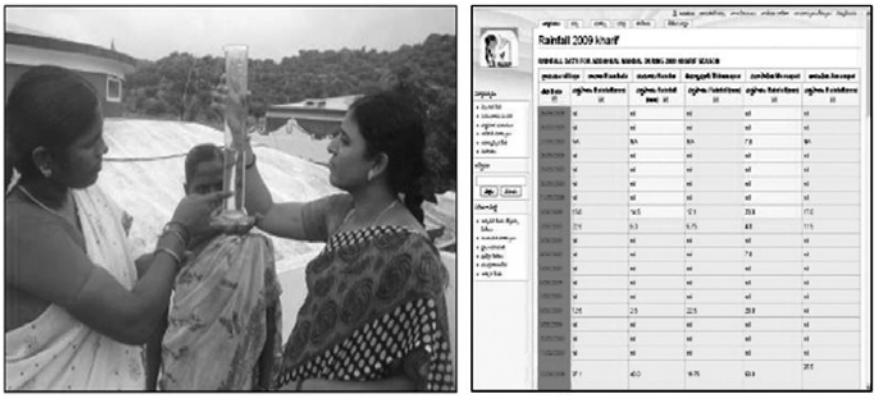


Figure 13.4: (a) Use of two-way videoconferencing in support of learning; (b) use of mobile phones and audioconferencing

The principal purpose of VASAT was to understand how improved knowledge amongst farmers would result in improved response to drought situations. On a separate yet parallel track, researchers at ICRISAT developed a method to forecast vulnerability to drought on the scale of a few villages. This method combines statistical analysis of meteorological data with satellite-derived imagery. The forecast, presented in the form of colour-coded maps, is made available for a cluster of villages and just ahead of the cultivation season. For these maps to be viable, data on rainfall from the localities needed to be made available to researchers. Women members of AMS made this data available from five villages daily during the season because they received training to do so using the Internet and a writable Web interface (Figure 13.5).

Figure 13.5: Learners measure and provide data



The VASAT learning materials were useful in helping women learners use colour-coded maps indicating how vulnerable each of their villages would be to drought in the oncoming season. The process of delivering this information was repeated every year during the main rainfall season in the area where the AMS members operate (Nagarajan, Kumar, Sreedhar, & Balaji, 2009). This report describes how the OER of VASAT were linked to improving drought awareness and preparedness amongst vulnerable families. Independent media coverage showed that as of 2009, this effort had an impact in that fewer people were migrating out of the villages than during an earlier period.

Copyright and Licence Concerns

In creating OER content, ICRISAT used its own materials derived from decades of research and training programmes. As such, there was no concern about material with third-party licences being included in VASAT OER.

Being an international organisation with United Nations privileges and immunities in various countries, ICRISAT could not make use of a popular open licence model such as Creative Commons (CC) since at that time (2005–2007), the CC licences were generally bound to specific national jurisdictions. Instead, ICRISAT made an offer to enable use of OER in a way similar to what was provided in CC 2.5 licences.[8] The applicability of Creative Commons licences to inter-governmental agencies with supra-national rights is still not a fully settled issue, and Creative Commons presently has an interim solution, pending the finalisation of CC 4.0 licences.

Costs

VASAT is an institutional project of ICRISAT and has multiple components with activities and outputs. Its budget allocation is meant to cover the totality of activities and outputs. Consistent with ICRISAT accounting standards, cost computation includes salaries paid to long-term or regular staff, besides costs of assistance and operational matters. Generation of material was a minor activity in a relative sense. With just one full-time expert deployed to create the material in total, the cost during five years (2004–2008) is estimated at approximately USD 45,000.

[8] http://vasat.icrisat.org/?q=content/learning-resources

Scaling Up VASAT OER Effort

The VASAT approach to learning content organisation was subsequently scaled up in a different initiative. The strategy in VASAT was to speed up both production and reuse of learning materials through encouraging granularity. The key principle was also to position the granular learning materials, the RLO, in a relationship with a structure, such as courses → modules → lessons. This approach was generalised for scale-up. The objective was that several hundred courses could be made available, with the opportunity for a user to have access to the whole course or just a lesson or RLO in it. A consortium of Indian ODL institutions, with ICRISAT and the Indian Institute of Technology in Kanpur providing the lead technical advice, have developed the essential architecture of such a repository. The repository design makes use of contemporary semantic Web practices.

The three ODL institutions in India are the School of Agriculture – Indira Gandhi National Open University, the Directorate of Agriculture – Yashwantrao Chavan Maharashtra Open University and the ODL Directorate of Tamil Nadu Agricultural University. The repository, Agricultural Learning Objects Repository (AgriLORE), is accessible at www.agrilore.org. The key step here is to develop a knowledge model (KM) of the subject-matter area. A KM enables a visual representation of various concepts in a subject area and their interrelationships.

In the AgriLORE repository, the theme is horticulture and each crop covered is a topic. A crop KM for tomato is presented here as an example (see Figure 13.6). An author can develop an RLO for a particular concept on the KM. Many others can develop their own contributions and link each to a concept on the model. Using the Web, all that the author needs to do is prepare the RLO and add keywords to it. These keywords are suggested, so to speak, by the KM online. Once the material is saved, the KM forms relationships between the just-added RLO and existing RLOs. These can be located through an online search. This search power enables locating RLO from different topics and modules through exploiting their relationship via the KM. In Figure 13.7, a screenshot from the AgriLORE repository shows how, whilst viewing one RLO, one can locate similar RLOs. AgriLORE also enables a user to sequence RLOs together to create a lesson or course.

Figure 13.6: A crop knowledge model for tomato

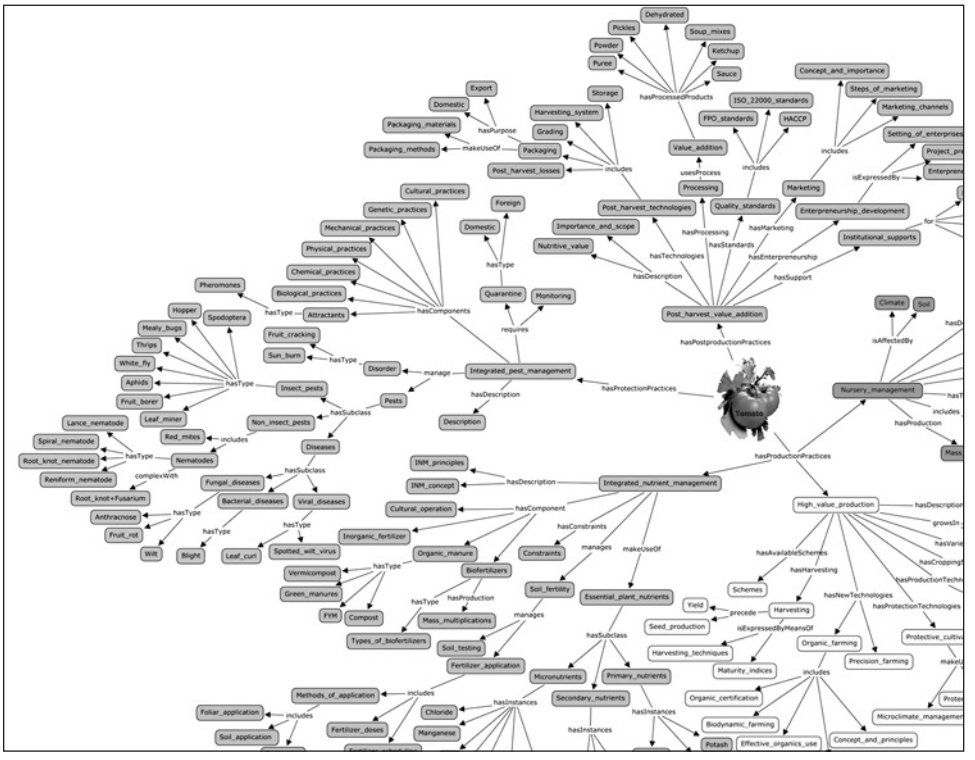
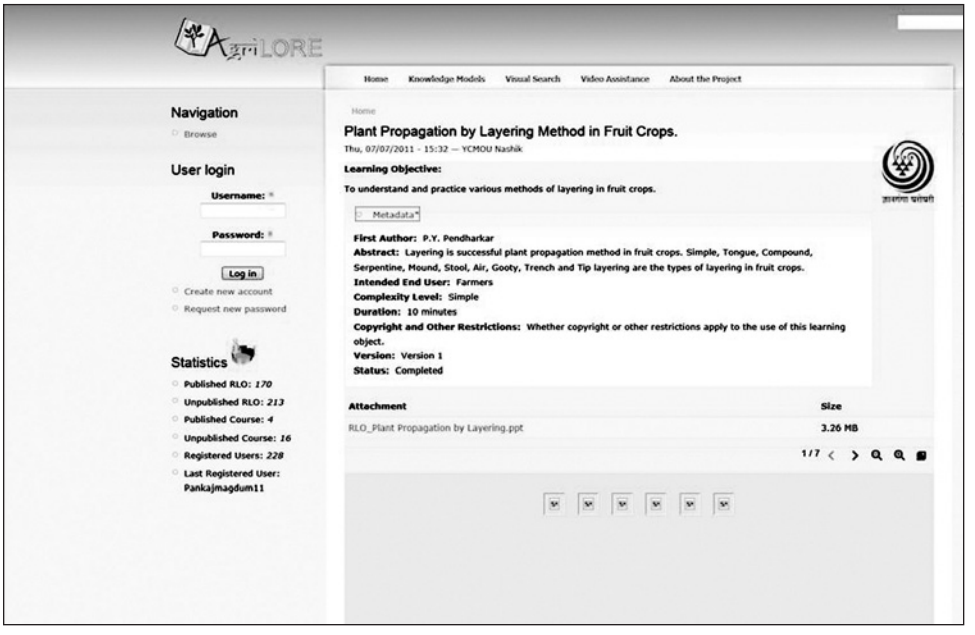


Figure 13.7: Screenshot showing how similar RLOs can be located whilst viewing one RLO



Inferences and Implications for the Way Forward

What can other organisations learn from the VASAT experience of OER and their adaptation and reuse? First, sustained management support is necessary to generate and update OER. Lack of interest from the management leads to lowered incentives for the participants. Second is the importance of using very simple tools for authoring and review. A number of technologies are available to build outstanding presentations on the Web. However, they may invariably have an entry barrier and might require sustained participation of another expert in the content creation and review process that may not always be practical. The more easily a faculty member or researcher can author a piece, the greater is the chance of OER emerging. Third is the careful adaptation of ODL methods in instructional design. Much of this technology-based practice has evolved in contemporary post-industrial settings and has inherent assumptions about the learner's familiarity with classroom or training facility experience. To render this into a supportive tool for outreach requires effort that needs to be recognised. The final inference is that the process does take time since it is linked to development, and a time scale of five years is generally a must to notice impact, provided interest and efforts are sustained. The agricultural sector, generally speaking, has not been as savvy in making use of contemporary Web technologies for training and information dissemination, and that situation added a new layer of challenge to the VASAT project. Others likely will experience less of a challenge in future.

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