

MOOC for Capacity Building in Indian Agriculture: Opportunities and Challenges



**NATIONAL ACADEMY OF AGRICULTURAL SCIENCES, NEW DELHI
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Preface

With the leitmotif of inclusiveness, the Prime Minister Narendra Modi unveiled his plan to change the country's image to Skilled India in his debut speech in the Parliament debate. Building skills, competencies and capacity of the human resources is receiving priority in addressing the challenges facing Indian agriculture. Given the diversity of Indian agriculture, the demographic profile of our population and more importantly, the scale at which it is required, the conventional methods of capacity building will be of little use. Information and Communication Technologies (ICT), that are playing an important role in bridging the digital divide, could successfully be deployed for this purpose. Online learning is a practice of linking learners, learning materials and mentors/teachers using technology mediation (especially, the Web and social networking). The Massive Open Online Courses (MOOC) are the recent disruptive innovations that can enable a small group of teachers/mentors to offer learning services to many people in the duration of a single course. A number of highly-rated universities in the world including MIT, Harvard and Stanford are at the core of this development. Ongoing discussions among experts in development and in learning technology indicate that MOOC can be meaningfully and effectively harnessed for training of public on a much large or massive scale. Considering the need to explore the opportunities and challenges for capacity building in Indian agriculture using MOOC, the Academy in partnership with the Commonwealth of Learning (COL), Vancouver, Canada convened a brainstorming session on 5th March, 2014 at New Delhi. The objective was to sensitize senior managers and policy makers about the opportunities of online training programs in general, and MOOC in particular, in development and to draw up a roadmap for its rolling out in NARS.

I express my gratitude to Dr. V. Balaji, as one of Co-convener from the Commonwealth of Learning (COL), Canada for his engagement with the Academy in co-organizing this important event. I am also thankful to Dr. C. Devakumar, Convener and Dr. N.T. Yaduraju, Co-convener for piloting this event and all the experts and participants, whose indulgence helped in shaping this Policy Paper.



S Ayyappan
President

MOOC for Capacity Building in Indian Agriculture: Opportunities and Challenges

1.0 PREAMBLE

“Agriculture is the backbone of Indian economy” - Mahatma Gandhi

The landscape of agriculture is expanding to include agribusiness in the supply-chain operations and management. Globalization is opening enormous opportunities for food and processed commodities while, at the same time bringing challenges of global competition. Linking agriculture with green economy and empowering farmers, women and youth with livelihood and entrepreneurship skills are necessary. Improving the competencies of scientists, teachers and extension workers, and delivering training in high-tech agriculture, secondary agriculture, and entrepreneurship will go a long way toward developing and adopting modern technologies that will bring more income to farmers.

Building skills, competencies and capacity of the human resources on a mass scale is a matter of priority in addressing the multiple challenges facing Indian agriculture. Given the diversity of farming in India, predominance of small and marginal farms and the demographic profile of our population, and the scale, conventional methods of capacity building will be of very limited use even in the near term. Innovations in Information and Communication Technologies (ICTs) which are playing an important role in bridging the digital divide could successfully be deployed for this purpose. Online learning is a practice of linking learners, learning materials and mentors/teachers using technology mediation (especially, the Web and social networking). The Massive Open Online Courses (MOOC) are the most current development in this continuing evolution. The MOOC enable a small group of teachers/mentors to offer learning services to many people in the duration of a single course. A number of reputed research universities in the world including the MIT, Harvard and Stanford are at the core of this development. Although MOOC is primarily an innovation in Higher Education sector, ongoing discussions among experts in development and in learning technology indicate that MOOC can be meaningfully and effectively harnessed for training of public on a much massive scale. Considering the need to explore the opportunities and challenges of capacity building in Indian agriculture using MOOC, the Academy in partnership with the Commonwealth of Learning (COL), Vancouver, Canada, convened a brainstorming session on the scope and opportunities of MOOCs for capacity strengthening in

Indian agriculture on 5th March, 2014 at New Delhi. The objective was to sensitize senior managers and policy makers about the opportunities of online training programs in general, and MOOC in particular, in development and to draw up a roadmap for its rolling out in NARS.

2.0 SKILLS GAPS ARE MASSIVE

In India, as of 2012, a work force of about 725 million spanning an age range of 15 to 59 years was available. The size of this workforce is expected to increase to about 860 million by 2022. The current capacity of skills development programmes has been just 3.1 million against an annual influx of 12.8 million, and India has set a target to skill 500 million people by 2022. Providing skills training to a massive population such as this requires several innovative measures over and above the currently established ones. As a sector, agriculture is a significant contributor to the Indian economy and to livelihood security, and it faces a massive demand for skills training. Annually, the total training capacity in agriculture is 1.98 million against a target of 20 million by 2022 (<http://labour.nic.in/upload/uploadfiles/files/Policies/NationalSkillDevelopmentPolicyMar09.pdf>). Reports from 3,439 organizations employing agriculture graduates indicate a skills gap of about 75 per cent at the graduate level and about 70 per cent at the post-graduate level (Rama Rao *et al.*, 2011). Similar gaps are observed even at lower levels of education, such as at the diploma and certificate levels. To enhance the rural economy, the reliance of large populations on production agriculture for employment must be reduced by encouraging skills development in other areas. A mix of on-farm and non-farm occupations for farmers and agri-preneurs might be considered. This can be done by expanding both rural industries as well as agribusiness sectors. A majority of the agricultural establishments (85%) would prefer to expand their markets, diversify their products, introduce technological changes and modernize their organizations. It is estimated that by 2020, the annual employment potential within the agriculture sector at a micro-level would be about 520,000 paraprofessionals (*ibid.*). The unique demographic advantage, if harnessed maximally, can pay rich dividends, both economically and socially.

3.0 THE SKILLS DEVELOPMENT ECOSYSTEM

In India, most Vocational Education and Training (VET) is acquired informally by picking up the necessary skills through 'learning by doing' while pursuing a vocation. To overcome the skill deficit, the Government of India under their Vocational Education Mission launched the National Vocational Education Qualifications Framework (NVEQF) in 2012 with an ambitious target to skill 500 million personnel

by the year 2022 (MHRD, 2012). It aims to integrate various academic, vocational, and technical streams, in order to provide diverse opportunities to students opting for vocational courses and ensure horizontal and vertical mobility as well as multiple entry and exit points. At the national level, the competency based curricula for vocational subjects at secondary and higher secondary levels are prepared by the PSS Central Institute of Vocational Education (PSSCIVE), a constituent of the National Council of Educational Research and Training (NCERT). The 66th round of the National Sample Survey reported that within the working age population (15 to 59 years), only 3 per cent had received formal vocational training and 5 per cent non-formal training (NSSO, 2013). Field-wise distribution of persons receiving formal vocational training reveals an appalling figure of about one per cent receiving training in agriculture (crop and non-crop based) and allied fields. In a corrective measure, the Agriculture Sector Skill Council (ASCI) was formally set up in September 2012 as an affiliate body of the National Skill Development Corporation under the Government of India. Its objective is to train, certify and accredit a workforce of 56.5 million farmers, wage workers, entrepreneurs and extension workers over 10 years through its training partners in the PPP framework.

3.1 Formal Vocational Education

Vocational education in formal streams is generally offered through diploma programmes at universities or through certificate courses at Industrial Training Institutes or Industrial Training Centers. Diploma and certificate programmes generally take about 2-3 years or about 6-12 months to complete, respectively. As of now, 72 institutes under the Union Ministry of Agriculture have a combined training capacity of about two million per annum. The School of Agriculture of Yashwantrao Chavan Maharashtra Open University (YCMOU), Nasik offers both certificate and diploma programmes in agriculture. The National Institute of Open Schooling (NIOS) offers about 12-15 certificate courses. In addition, Khadi and Village Industry Centres, Community Polytechnics, State Institutes of Rural Development and Extension Training Centres are offering non-formal training in agriculture and allied sectors.

3.2 Non-formal Vocational Training

In the non-formal stream, VET in agriculture is offered under 17 Ministries and Departments of the Government of India through their training centres. About 100 skill-based, short duration programmes are offered under the Modular Employable Skill (MES) programme of the Ministry of Labour and Employment. The MES modules (119 skills/modules) in the agriculture sector are available in

the following six areas: (i) agriculture (40 skills), (ii) poultry (31), (iii) sericulture (26) (iv) fisheries (16), (v) food processing and preservation (1), and (vi) animal husbandry (5). The curriculum is approved by the NCVT (National Council of Vocational Training) and the duration of the programme varies from module to module. In addition, nearly 28 trades in the agriculture and allied sector have also been identified for inclusion in vocational apprenticeship programme. The Krishi Vigyan Kendras (Farm Science Centres) impart training in 52 diverse areas annually to about 50,000 farmers, farm women, and rural youth and grass roots level extension workers.

3.3 Open and Distance Learning (ODL)

The Open and Distance Learning (ODL) has become a popular mode of learning due to flexibility in place, time and age of learning. The ODL needs to be combined with face-to-face programmes and mobile training system to be effective for the development of bankable skills. The School of Agriculture of the Indira Gandhi Open University (IGNOU) offers two PG Diploma, one PG certificate, six certificates and three awareness programmes. These ODL programmes aim at development of entrepreneurs, increased employment opportunities, higher earnings and better work environment in rural areas. Tamil Nadu Agricultural University (TNAU) offers 15 certificate level ODL courses and two diploma courses (www.tnau.ac.in).

3.4 Vocational Training in Agriculture in School Education

In India, more than 63% of schools with higher secondary sections are located in rural areas, 10.3 % in tribal areas and 9.6% in hilly areas (MHRD, 2012). This implies that agriculture and allied vocational subjects could be offered on a large scale in diverse skill areas to cater to the needs of rural, tribal and hilly areas. As oft stated, in school education, agriculture should form a core component of the general science subject at upper primary and lower secondary stages and it should address key concepts and principles of sustainable agriculture and development (Sacheti and Mehrotra, 2000). The forthcoming National Agricultural Education Project funded by the World Bank can provide the necessary fillip in this direction.

3.5 Scope for Enhancement of Skills Development

The VET in the agriculture and applied sectors is lacking both in quantity and quality. Barriers to quality VET delivery include perceptual barriers, lack of coordinated efforts, lack of adequate financial support, inflexible and antiquated curricula, poor quality of teaching staff and vocational training, lack of skill standardization

and poor linkages with industry. The National Vocational Education Qualifications Framework now in place provisions for different learning pathways – both academic and vocational – that integrate formal and non-formal learning, notably learning in the workplace, and that offer vertical mobility from vocational to academic learning. The framework has standards for comparability of general education and vocational qualifications at appropriate levels and a nationally approved framework of affiliation. Accreditation of institutions and multiple certification agencies are encouraged within NVQF.

All said, the underpinning reality is that the current VET system does not have the capacity to respond to the agriculture sector's wide-ranging and dynamic skills. Alongside there is mounting evidence that traditional delivery approaches for skills development can no longer meet the sector's increasing cumulative demand. Technology-enhanced learning (TEL) using ICT thus becomes a force multiplier for achieving social and economic targets. Folding the future in allows us to innovate in skills development. Identifying current and future skills shortages or gaps within the agriculture and allied sector is important for ensuring that available resources are being effectively allocated to meet the skill needs of the sector.

4.0 MOOC FOR BRIDGING THE SKILL DEFICIT

The MOOC are a disruptive innovation resulting from the convergence of distance education (DE) – with its well-established processes for curriculum development and assessment and accreditation, and e-learning which offers anytime learning opportunities with a defined pedagogy. The innovative MOOCs provide greater levels of interaction with much higher levels of participation than either conventional DE or current practices in e-learning. Under their landscape, courses are offered by a team of teachers affiliated with a university or educational institution to individuals located in any part of the world. This has enabled learners, particularly those located in remote areas, to gain access to learning delivered by distinguished faculty from prestigious educational institutions that they would otherwise not have access to. Most MOOCs are offered for free, with an optional nominal charge for the certification or accreditation. A typical MOOC course is about 8 to 12 weeks in duration with defined start and end dates. Normally, no eligibility requirements or prerequisites are set, though the student is expected to commit an average 2-6 hours a week to course work.

Launched in early 2012 in the USA by Prof Anant Agarwal (MIT), MOOCs have enhanced the popularity of online services as a medium in training and continuing education and at the same time increased the accessibility of digital learning

or educational resources. They have leveraged unprecedented opportunities for imparting meaningful and effective training on a massive scale (Sive and Sarma, 2013; McNutt, 2013). While there is a debate in the USA about the need to reduce higher education costs (student indebtedness in the USA is currently being in excess of one trillion dollars or about INR 6 lakh crores), there is no doubt that the MOOC technologies are most relevant for developing countries in imparting large scale training for professional development. This is evidenced in a number of analyses published by the Commonwealth of Learning (COL, 2014). Key information on current MOOCs, leading players and known implementation issues are presented in Boxes 1 and 2.

Box 1: What is a MOOC?

A Massive Open Online Course (MOOC) is a disruptive innovation encasing following four important concepts due to technological advances.

The term, **Massive** is about the scope of enrolling a large number of students in a course. For instance, the MOOC on Artificial Intelligence offered by the Stanford University attracted over 160,000 students, of which about 23,000 successfully completed the same.

The epithet, **Open** has several connotations, such as free access or free registration to the courses. It also implies the use of open curriculum, open platform, and open assessment (using open badges) for certification. It is increasingly about the use of open license and release of the course content as open educational resources. Openly licensed MOOCs will usher in creation of newer innovative versions with different pedagogical interventions, languages and formats.

It is accepted that meanings of Massive and Open vary across offerings and institutions.

The appellation, **Online** as commonly understood signifies that a MOOC is an online learning resource that is available 24 × 7 for anyone to register and learn with access to the internet. It is much more than the online learning within the framework of a learning management system. The emergence of MOOCs has led to massive scale up, enabling learners to interact with the content and peers. This has led to substantial reduction in the number of tutors or teaching assistants to teach an online course. This is definitely an innovation in the world of online learning seeking cost-effectiveness and 'economies of scale' of distance education.

The letter C in MOOC though refers to Course but many expand it to include Conversations or Conference or Certification. It is, however, important to note here that it is a course with a specific start and finish schedule. It follows the classroom or cohort-based paradigm, and not the distance learning paradigm of learning at own pace and time.

The MOOC is moving beyond self-directed learning to network-directed learning where peers as well as mentors support a learner. It is learning as a conversation and teachers are not necessarily privileged to be a part of ongoing conversation

Box 2: Who are the leading players in MOOC?

1. MOOC providers in English:

edX (www.edx.org) is a not-for-profit consortium comprising 28 universities, including the founders-Harvard University and Massachusetts Institute of Technology (MIT). It includes 17 partner institutions from outside US, five European universities and 11 universities from other countries. The Indian Institute of Technology, Bombay is one of the recent entrants. It currently offers 62 courses and issues certificates after successful completion of a course at no cost but does not offer course credits. Another interesting initiative is its collaboration with International Monetary Fund (IMF) for providing policy-oriented economic courses for government officials of its member countries.

Coursera (www.coursera.org) currently offers over 500 courses, including over 145 signature track courses (meaning fee-based and awards certificate) with over 5.5 million learners, involving 10 US state institutions and 97 other global partners (as on Nov, 2013) including the World Bank. It is making all out efforts in establishing itself as the largest player in the field. The key attraction is its platform with better and more sophisticated automatic assessment system. Further, it has diversified its mission to include school and pre-school education by providing teacher training courses.

Udacity (www.udacity.org) offers 28 courses including 5 which are credit earning with a fee of \$ 150. It has no university partners but individual lecturers from diverse backgrounds. Udacity's CS101, with an enrolment of over 300,000 students, was the largest MOOC to date. Established in January 2010, Udacity launched its first MOOCs-for-credit, in collaboration with San Jose State University. In May 2013, the company announced the first entirely MOOC-based Master's Degree, collaboration between Udacity, AT&T and the Georgia Institute of Technology, costing \$7,000, a fraction of its normal tuition.

Udemy (www.udemy.org) provides 8000 courses for one million learners. Courses are based on practical skills. Like Udacity, it works with individual teachers but not with institutions.

Futurelearn (www.futurelearn.com) led by British Open University, was launched in UK in Sept, 2013. Meanwhile Trinity College, Dublin, Ireland and Monash University, Australia have joined in. Course offers have not been announced, but are expected to be offered free.

Alison, based in Ireland, a social enterprise distance learning provider offers about 600 courses to 2.5 million learners worldwide.

2. MOOC providers in languages other than English

Iversity (iversity.org) is a consortium of leading research universities in Germany offering MOOC in Deutsch.

FUN (www.france-universite-numerique-mooc.fr) based in France offers in French.

Miriada (<https://www.miriadax.net/>), a consortium of universities in Spain offering MOOCs in Spanish.

UnX (<http://www.redunx.org/>), a MOOC consortium in Latin America offers courses both in Spanish and Portuguese.

CNMOOC (<http://www.cnmooc.org/>), a consortium of leading research universities in China for MOOCs, led by Shanghai Jintao University.

Besides well-branded universities in North America and Europe, inter-governmental organizations such as the World Bank and UNESCO have also started to offer MOOCs. India is possibly emerging as a pioneer in designing and offering MOOC for competency development. IIT-Kanpur (IITK) and Commonwealth of Learning (COL) have jointly delivered a MOOC on mobiles for development (topics covered include agricultural extension, rural finance and education) that attracted learners from 116 countries. Certificates of completion and competence were awarded by IITK Center for Continuing Education and COL (Perris, 2013). Of those learners who registered, close to 500 were from the agriculture sector in India. Another example comes from IITM at Chennai, in association with NASSCOM. Their MOOC on Foundations of IT ran for 10 weeks during April-May 2014 with a certificate option for learners who qualified in proctored examinations held at defined contact centers. About 55,000 learners enrolled in the course with about 7,500 opting for the proctored examination and certificate. This demonstrates the rapidly building capacity in India for managing the platforms necessary to impart online training for the advancement of learners and professionals (Anon, 2014). MOOCs are gaining popularity in many other parts of the world as well (Bonvillian and Singer, 2013; Daniel and Uvalic-Trumbic, 2013). A research report from Columbia University on MOOCs shows that they offer a new pathway in competency-based credentialing (Hollands and Tirthali, 2014), thus opening up career-oriented learning opportunities that can benefit professionals. A detailed survey of 35,000 learners in MOOC courses showed that learners from BRICS countries were predominant with existing higher education experience. MOOCs for learners with limited exposure to post-secondary education are still to be explored. The deployment of MOOCs for VET will help bridge the skills gaps discussed earlier, and will position India as a global leader in this area, especially giving an additional focus to MOOCs.

5.0 NARS NETWORK: INSTITUTIONAL OPPORTUNITIES

The NARS is a network of over 1500 centres that span over 100 institutes, 70 agricultural universities, and 450 colleges that include private institutions, regional stations, KVKs, Farmers Training Schools, private Foundations, SHGs, NGOs, and Panchayat Raj facilities. There is thus a scope to deploy MOOCs in NARS. MOOC content can be created by leveraging the enormous Dataware of NARS, which includes thousands of knowledge products, technologies, products, integrated models and skills as well as success stories from NAIP. e-Learning modules and RLOs can be resourced to make this content relevant and profitable. Over 450 Experiential learning units established in SAUs with financial support

from the ICAR Education Division are already turning out good entrepreneurs. This facility will also be helpful in imparting practical training to students who have passed the knowledge-tests within a given MOOC. We can also build VET capability to cater to skill demands of green economies and green occupations such as management of green supply chain, organic certification, renewable energy, and rainwater harvesting. The technological advancements in agriculture and allied sectors would require upgrading the traditional skills and providing training in new and emerging fields, such as organic farming, hi-tech floriculture, protected cultivation, micro-propagation, integrated pest management, integrated nutrient management, production of quality seeds, post-harvest management, value addition, geographic information systems and conservation of biodiversity.

6.0 THE BRAIN-STORMING SESSION

In view and consideration of this context, the Academy (NAAS), in collaboration with the Commonwealth of Learning (COL) organized a one-day brainstorming session on the scope and opportunities of MOOCs for capacity strengthening in Indian agriculture. The meeting, held on 5th March, 2014 was enriched by eminent research and education managers, extension specialists, scientists and other participants with expertise in major sectors of agriculture, livestock, and ICT.

In his opening remarks, Dr S. Ayyappan, President, NAAS underpinned the potential of the MOOC as an innovative capacity-building tool for Indian agriculture as a whole. The task of training and extension is massive because of the millions of farmers in their languages which are highly diverse with over 1000 dialects. The training and capacity development tasks must be customized for audiences such as policy makers, highly diverse farming communities and the public at large.

Prof Ram Takwale, the Chair of the UGC Committee on MOOC shared insights from a draft report submitted to the UGC on MOOCs which proposed a series of measures to introduce them within the mainstream higher education. Dr. C. Devakumar reported on the landscape of higher education and skills development across the spectrum of agriculture and entrepreneurship. Potential to deploy MOOCs in the agricultural sector was immense when viewed from the perspective of skills development. For example, in just one sector, namely food processing, the current annual gap is of the order of 10:90 for paraprofessionals. Meeting the requirement of about 56 million para-professionals in agriculture by 2020 is possible only through a meaningful combination of conventional and innovative methods of training and capacity development. Dr V. Balaji and Dr Balwinder Sodhi jointly presented the architecture of MOOCs and demonstrated

the utility of a hand-held server which can be charged through the solar power to enable a virtual classroom even in the most remote areas and villages. They also highlighted the massive scale of enrollment and the equally massive scale of learner engagement. Bringing these together was the true strength of the technologies behind MOOCs, they emphasized. Dr P. S. Pandey and Dr N. T. Yaduraju highlighted the extraordinary catalyzing role of the National Agricultural Innovation Project (NAIP) in strengthening the NARS in terms of infrastructure, capacity building, ICT gateways and platforms, and the creation of knowledge products and e-resources. This is besides the very large volume of publicly-accessible digital materials available with the Directorate of Knowledge Management in Agriculture (DKMA) in ICAR. A large number of scientists have been trained in developing and sharing digital knowledge. An overview of NAIP investments in information and knowledge assets showed that there are now 425 UG courses available online, corresponding to 1127 credits and 15680 hours of instruction. This is a massive collection, perhaps the largest in English in agriculture and includes veterinary and animal sciences, horticulture, fisheries, forestry, home science, and dairy technology besides agriculture. A collection of about 10 million pages from agricultural science publications and about 7500 thesis dissertations in full text are digitized. This massive digital production is complemented by agropedia, a unique digital content-aggregation platform covering English and Indian languages. Dr. H. Chandrasekaran informed that the Consortium for e-resources in Agriculture (CeRA) has enabled NARS staff, scholars and students to access several thousand journals online enabling positive changes in both quality and quantity of research publications from at least a few NARS centers. There is a notable advance in the adoption of contemporary e-learning methods and technologies such as production of Re-usable Learning Objects (RLO's) as base units in course material production. Taken together, these advances provide Indian NARS with unique global advantages that are the result of focused investments in digital assets production and management, which, other than China, no NARS has achieved.

Dr. N. V. Satyanarayana, emphasized the potential of MOOCs for drawing online learning resources and the opportunity for launching them through PPP mode. Many experts, to name a few, Prof. M. L. Madan, Prof. M. P. Yadav, Dr. J. S. Bhatia, Dr. Arun Verma, Dr. V. P. Sharma, Dr. R. K Jain, Dr. Mahesh Uppal, Dr. Prem Dureja, Dr. Thirunavukkarasu, Dr. Mayuri and Dr. Santhi enhanced the deliberations with their vast practical expertise in the field of education and extension. A few select e-learning module creators were also present and contributed to the discussion. Indeed, the experts availed a brief breakout session to explore opportunities for

MOOCs in higher education, and agricultural extension, particularly in skilling women, youth and small farmers.

In the discussions, participants brought forward a number of ideas and insights from their own training requirements as well as participation in MOOCs. There was a consensus that the massive needs for capacity development among various target groups cannot be met by conventional methods alone. Expansion of brick-and-mortar training infrastructure requires time which the NARS cannot afford. The question of internet access across the country was considered, and the participants were of the view that given the rapid pace of expansion of data connectivity in institutions under NKN and the affordability of basic data access on mobile devices for most students, this need not be a deterrent any longer in trials of massive online learning. The media production centers in SAUs' can be carefully re-purposed to support production of learning materials for MOOCs while the KVKs and allied extension centers can serve as centers for learner-mentor contact and for conducting proctored examinations. The experiences of efforts such as NPTEL-India under MHRD in production of e-courses and MOOCs can be taken advantage of. Participants further deliberated on the issues in sector-specific small groups covering capacity and skills development needs from competency to basic levels and made a number of recommendations.

Participants concluded that a pilot MOOC should be organized within next six months. The Indian NARS is advantageously positioned to lead this movement with its extensive network of access centers, digital assets and subject-matter or domain capabilities.

Prof. R. B. Singh in the concluding session expressed his joy of discovery of this new disruptive tool by the participants and hailed it as the MOOC for Development (MOOC4D) Movement, helping institutions meet the massive requirements of competencies and skills development, which is a national priority. The MOOC for Development needs to be viewed as a movement because of potential to contribute to the national priority to build employable and income-generating skills and higher competencies on a massive scale. The key to success will be in designing a comprehensive flow of skills and knowledge from the universities to the farms, with high levels of customization, he alluded. There are adequate resources available under the current Plan to launch a series of initiatives in this respect. The current set of e-courses in agriculture can be thought of as a good starting point even if only within limitations. It should be possible to form a group with enough people to propose a programme in detail and launch it under NARS under the XII Plan.

7.0 THE WAY FORWARD - RECOMMENDATIONS AND ACTION POINTS:

It is time that the potential of the MOOCs in Indian agriculture be explored, especially given the strong knowledge-to-action dynamic in this sector. The MOOCs have the potential to make India a global leader in applying online training for development. The COL's analysis shows that other than the University of Florida, there is not a single Land Grant system offering the MOOCs on topics relevant to agriculture.

In the 21st century knowledge economy, qualified human capital is a must for upgrading outputs and outcomes through the integration of science, technology and innovation and making agriculture both an attractive and profitable venture. To meet the projected target of graduates and postgraduates in various fields of agriculture, technology-mediated learning must be internalised in higher education. The Fifth Deans Committee of the ICAR is set to revise the course curricula and syllabi in addition to engaging on issues of learning resources and pedagogical issues. The MOOC may find a place in the revised learning system. The higher education institutions may develop custom-designed MOOCs to meet the skill requirements of the students.

The National Occupational Standards set by the Sector Skill Councils (<http://www.nsdcindia.org/national-occupational-standards.aspx>) may be utilized for setting benchmarks for the development of curricula, the training of teachers, trainers and students, and the recruitment of capable individuals as mentors. Courses may be customized for preparing career paths and succession plans. Linkages may be developed between qualifications at various levels for seamless transitions and career mobility.

The agriculture and allied sectors continue to be the biggest employer. About 52% of the total workforce is still employed by the farm sector which makes more than half of the Indian population dependant on agriculture for sustenance (NSSO, 2013). To enhance the productivity and contribution of agriculture to Indian economy, a strategic plan on inclusive growth may be developed for skilling the workforce engaged in agriculture and allied activities. The Government of India has shown its strong commitment towards skilling people by making good investments for skills development, formulating a National Policy on Skill Development in 2009, and creating enabling institutions such as National Skill Development Agency (NSDA) and National Skill Development Corporation.

Although VET in agriculture is provided by different agencies in multiple fields, there is no uniformity in programme content, methods of delivery, duration, practical orientation, and so on. This calls for enforcement of standardization and certification of such programmes as proposed under the NVEQF. Structural changes are needed in the design, development and implementation of VET programmes to make them

more relevant. Public-private partnerships in terms of meeting the standards set by the employers and demands of individuals through the NVEQF may be promoted for a shared vision. New structures may support modular and credit based VET programmes, integration of education and training within both the school and out-of-school systems, compatibility between different levels of qualifications and policy on the vertical mobility of vocational graduates. The structural changes may be designed to give considerable freedom to vocational schools and colleges in devising their educational programmes and reducing the high dropout rate of young people leaving school for employment. Internship may be made a mandatory component of all VET programmes. The agribusiness industry needs to play a crucial role in training and skill standardisation and develop and drive the implementation of integrated and long-term solutions to agriculture skill needs.

A few centres of excellence could be established in VET, which may function as a laboratory for all research and development activity and become a strategic resource for skill development in various industry sectors. They may serve as nodal centres for design, innovation and development of standards for VET services, governance and programmes relevant to various industries. These centres may conduct impact analysis of skill development programmes vis-à-vis operations and processes. In order to attract and nourish the talents and competencies of the youth, a paradigm shift from traditional methods of teaching and learning in education is needed. The lecture-based methods and certificate-orientated learning may be complemented by methods which are more activity or problem-oriented. Innovative MOOC may be adopted to inculcate problem solving abilities through peer conferences, specific to each subject and to promote cross-curricular abilities.

We can therefore envision a multi-phase, two-pronged strategy to harness the power of MOOCs in Indian agriculture. One prong would be to deploy MOOCs for enhancing higher education and competency development; this can be launched initially as a pilot study platform. The other prong would be to gradually enter the VET landscape which, as noted earlier, links to major policy priorities.

In view of these considerations, the following recommendations and action-points were made:

- ✺ ***MOOCs-for-Development can be a new paradigm in Indian agriculture :*** MOOCs for development offer new opportunities for capacity building on large to mass scale in Indian agriculture. Customized MOOCs to suit different audiences (such as professionals, NARS scientists and faculty, skilled technical personnel, extension personnel, as well as for general awareness on food production among the educated, degree-holding public) could be designed and offered.

- ž Integration of MOOCs into National Vocational Education Qualification framework (NVEQF) in order to ensure horizontal and vertical mobility for the students studying the MOOCs. A system of categorization of various MOOCs as per NVEQF may be developed

- ž **Pilot MOOCs for NARS personnel may be offered in the immediate term.**

NARS personnel will require a range of courses of different durations (short, medium or long) and suitable partners from India (and from abroad, if required) may be identified.

Carefully organized collection of Learning Analytics from the pilot courses will be essential for analysis of patterns of interaction on the courses; feedback from learners and mentors may be collected after every course.

- ž ***Set up a NARS Observatory for MOOCs. This would be in the nature of a task force and would***

Monitor and report on key changes in the rapidly evolving technology of MOOC platforms.

Report on technologies and good practices in online ID management and learner profile management.

- ž ***Establish a task force to analyse available frameworks for learner assessment*** and for offering certificates and credentials to learners for MOOC participation in the context of ICAR-SAU practices.

- ž ***Set up an expert group to assess media centers in ICAR-SAU for suitability to produce pedagogically sound online learning materials and to recommend suitable steps***

- ž ***India is among the most advanced countries globally in identity verification and management in Governance (as is evident from the conduct of General Elections). Use of the expertise from that sector in ID management for contact and examinations centers management may be explored in offering MOOCs for Development.*** In such a context, the existing extension facilities of ICAR-SAU system may be made use of, especially in MOOCs for skills development

- ž ***ICAR may well consider forming appropriate partnerships with stakeholders in the for-profit sector to identify topics and content*** for developing courses that meet a demand; such a partnership can be explored also for delivery to specific audiences and groups; targeting convergence with initiatives,

organizations such as ATMA and projects such as ARYA, FARMERS FIRST, Students READY, Agriscience Foundation etc. can be a good beginning in this regard.

- ž **Key MOOC components can be unbundled and operated by the most competent stakeholders:** Every MOOC involves multiple components. The key ones are: digital content development (including re-use or adaptation of approved materials) on sound online pedagogic practices; quality assurance of content; course marketing; online registration of learners and creation of their profiles; security and integrity of online course platforms; mentoring of online learners through well-developed facilitation techniques; contact and examination centers management; assessment and certification. Each component or set of components can be handled by a stakeholder most competent in it. For example, digital content production can be managed through the media centers; joint or peer review processes of e-courses can be deployed for quality assurance; NPTEL (NMICTE of MHRD) can be harnessed for platform design and management; contact center management, assessment and accreditation systems can be developed jointly with the DEC. Skills-oriented course design and course marketing can be carried out with the private sector. Certification can anchor in the NARES system. This will allow the most competent stakeholder to put a well-tested practice into operations quickly with some rapid adaptation as appropriate. Existing private players in digital learning industry such as Eudocomp etc. can be consulted and collaboration can be made to leverage their expertise in quick turnaround for producing MOOC Curricula.
- ž **Existing e-courses and digital materials from DKMA are key assets in building MOOCs.** Their immediate usability may be explored and suitable steps for their rapid adaptation in MOOCs may be identified
- ž **ICAR may consider making use of two specific practices** already adopted in India in

Setting up a National Repository of Open Educational Resources in Agriculture (following NCERT's practice in education)

Emphasis may be about people not on technologies alone whereby their knowledge as a social product emerging as an interface of machine, individual, society and learning as a process that leads to development.

Adopting a suitable open licensing policy for content whereby re-use of material published online is permitted for use without change and for

non-commercial purposes (NMICTE of MHRD stipulates the use of Creative Commons license under provisions of attribution to source (BY), share alike (SA) and non-commercial (NC) re-use)

In general, ICAR may consider making suitable investments in promoting online learning on a mass scale with making provisions for research in learning technology and use of learning analytics to improve quality of mentoring and instruction. ICAR may become the leader of the MOOCs for Development movement in India through building capacities and skills on a mass scale compatible with national priorities. Leadership in MOOC excellence in India would mean leadership globally for MOOC deployment for capacity strengthening and skills development on a mass scale which is as yet an area of exploration.

Streaming with the national goal of Skilled India, a new initiative to fund for piloting MOOC for capacity building in Indian agriculture may be prioritized as soon as possible. **ICAR could consider establishment of two centers of excellence under the XII Plan** for (a) content creation and management for MOOC (b) innovations in architecture for multiple services including online delivery, mentoring, assessment, examination, accreditation and for use of Learning Analytics.

Postscript : Following the deliberations in the Brain Storming Session reported here, IIT-Kanpur and COL organised a MOOC on MOOC (5 Sep- 2 Oct 2014) that drew 2304 joiners from 91 countries (Perris, 2014). Hon. Prime Minister of India has approved a national MOOC initiative termed SWAYAM (Student Web Activities for Young Aspiring Minds) in the India-USA framework for collaboration in Open Education (PIB, 2014) to be implemented by MHRD.

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List of Acronyms

ASCI	Agriculture Sector Skill Council
COL	Commonwealth of Learning, Vancouver, Canada
DKMA	Directorate of Knowledge Management in Agriculture (ICAR)
ICAR	Indian Council of Agricultural Research
ICT	Information and Communication Technology
IGNOU	Indira Gandhi Open University
IITK	Indian Institute of Technology Kanpur
IITM	Indian Institute of Technology Madras
KVK	Krishi Vigyan Kendra
MES	Modular Employable Skill
MHRD	Ministry of Human Resource Development
MIT	Massachusetts Institute of Technology Cambridge, USA
MoL&E	Ministry of Labour and Employment, Govt. of India
MOOC	Massive Online Open Course
NAEP	National Agricultural Education Project (ICAR- World Bank)
NAIP	National Agricultural Innovation Project (ICAR- World Bank)
NARS	National Agricultural Research System
NCERT	National Council of Educational Research and Training
NCVT	National Council of Vocational Training
NIOS	National Institute of Open Schooling
NKN	National Knowledge Network, Government of India
NME-ICT	National Mission on Education through ICT
NSDA	National Skill Development Agency
NSDC	National Skill Development Corporation
NVEQF	National Vocational Education Qualifications Framework
ODL	Open and Distance Learning
PSSCIVE	PSS Central Institute of Vocational Education, Bhopal (M. P.)
RLO	Re-usable Learning Object
SAU	State Agricultural University
TNAU	Tamil Nadu Agricultural University
VET	Vocational Education and Training
YCMOU	Yashwantrao Chavan Maharashtra Open University

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