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***Linking Agricultural Universities with Civil Society, the Private Sector, Governments and other Stakeholders in support of Agricultural Development in Africa
Partnerships to unlock the Potential of Agricultural Development in Africa***

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Editors

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Table of Contents

Editorial	i
Sub-theme 1: <i>Partnerships and innovations to strengthen higher education in Africa</i>	
Liberalization of higher education in Sub-Saharan Africa Masanja, V. G. and Lwakabamba, S.	1
African Higher Education in the 21st Century: Blending optimism with reality Osiru, M., Karungi, J. and Adipala, E.	9
Financing a massified African higher education: Emerging approaches and issues Okalany, E. and Adipala, E.	21
Higher education policy management and governance in Malawi Kalizang’oma, R.	31
Recreating a University for development relevance: the case of University of Juba Akec, J.A.	37
Evolution of Bunda College of Agriculture into Lilongwe University of Agriculture and Natural Resources Kanyama-Phiri, G.Y.	55
A strategic approach for African Agricultural Universities experiencing low human capacity to engage in graduate-level training: Lessons from Gulu University in Uganda Ongeng, D.	77
Science for development and EU-Africa advanced training partnerships: The case of TropiKMan PhD programme De macedo, J.B. and Melo, A. M. P.	87
The African Centre of Excellence for Emerging and Zoonotic Diseases (ACEEZD) at the University of Zambia Mweene, A. S., Hang’ombe, B., Simukoko, H., Phiri, A., Munyeme, M., Sikasunge, C. and Simuunza, M.	97
African Centre of Excellence for Innovative Rodent Pest Management and Bbiosensor Technology Development (ACE IRPM and BTD- Rat-Tech) Makundi, R.H. and Massawe, A.W.	105
Harnessing regional and national capacities to strengthen agricultural research for development in Africa: a case study of DAAD support to RUFORUM Chindime, S., Uwituze, S., Osiru, M. and Adipala, E.	117

Facilitating placements of graduate students to build capacity for National Agriculture Research and Extension System: The case of iAGRI in Tanzania Chindime, M. S., Uwituze, S., Nampala, M. P., Osiru, M. and Adipala, E.	127
Harnessing higher education institutions' capabilities in controlling trans-boundary animal diseases at the livestock-wildlife interface: the case for African swine fever in Uganda Masembe, C., Ademun, A .R. O., Stahl, K., Atimnedi, P. and Muwanika, V. B.	137
My Journey to Makerere University and experience as a beneficiary of an academic mobility scholarship Oteyo, I. N.	145
Innovative research and teaching methods towards creation of entrepreneurs Sila, D.N., Tsunoda, M. and Molteni, M.	153
Tapping youth innovativeness through education, entrepreneurship and financial inclusion for accelerated development in Africa Egeru, A., Osiru, M. and Adipala, E.	157
Transitioning to the world of work through internship: Learning from a regional organisation Kalungi, J., Kuteesa, C. and Goobi, M.	167
Perspective on strengthening collaborative research in agriculture and human capital development in Africa Mayada, M. B.	175
Refocusing student –farmer attachment at Gulu University for improving efficiency of smallholder farmers in Uganda Kalule, S.W., Okello, D.M. and Ongeng, D.	179
Establishment of current and emerging trends in agricultural labour markets in Kenya Bebe, B.O. and Owuoché, J.O.	187
Positive work approaches and their influence on institutional high performance and staff wellbeing: A review Aweko, J.	195
Catalyzing change in African Universities: Developing transformational leadership and management capacity in African Universities Okalany, E. and Adipala, E.	203

Sub-theme 2: *Strengthening ICT and knowledge management in agriculture*

A mechanism for controlling incoming internet traffic into multi-service networks Kato, J.	215
Documenting and disseminating agricultural indigenous knowledge for sustainable food security in Uganda Kaddu, S. and Haumba, E.N.	221
Integration of indigenous knowledge with ICTs in managing effects of climate change and variability in Kajiado County, Kenya Manei, N., MacOpiyo, L. and Kironchi, G.	231
Characteristics of effective nutrition-agricultural extension interventions: lessons from civil society extension organizations in Uganda Sitenda, T., Mangheni, N. M., Walekhwa, P. and Kabahenda, M.K.	237
Enhancing agricultural knowledge sharing among smallholder farmers in Uganda: An evaluation of mobile and web technologies Mwesigwa, E., Tulinayo, F. P. and Mirembe, D. P.	247
Nutrition education competences needed by agricultural extension workers: perceptions of farmers and field extension workers in Uganda Mangheni, M. N., Shimali, F. and Kabahenda, M.	253
Community perceptions on the role of indigenous knowledge in policy recommendations for co-management modelling Haambiya, L., Kaunda, E., Likongwe, J., Kambewa, D., Chama, L. and Musuka, C.	261
Implementation of a computerized accounting system at RUFORUM Secretariat Nakyobe, J., Nambi, E., Aguti, E. and Ssewankambo, W.	277
Sub-theme 3: <i>Strengthening University outreach, community engagement and innovation platforms</i>	
The role of ICT's in enhancing university-smallholder farming community engagement Tulinayo, F. P., Mirembe, P.D. and Obaa, B.	287
Strengthening capacity for effective smallholder farmers support through university, research and government partnership Ngotho, T. and Norris, D.	293
University community linkage: selection and piloting of agro-innovation enterprise clusters to enhance income of households in rural areas of Tigray region, northern Ethiopia Kebede, M., Dawit, G., Mshenga P., Mugonola, B., Nico, C. and Olifemi, A.	299

Farmers groups and extension impact: Exploring female farmers' roles, levels of participation and livelihood benefits within milk bulking groups of Dowa and Dedza districts in Malawi Mvula, N. and Mzamu-Kampanje, J.J.	305
Influence of organizational structure on actor interaction within community level innovation platforms in eastern Uganda Mukebezi, R., Obaa, B. and Kyazze, F.B.	313
Socio-economic drivers of ecosystem service provision Ssengabi, M., Bonabana-Wabbi, J. and Mugonola, B.	319
Empirical assessment of the relative performance of orthogonal contrast analysis for optimization Séro, B.N., Salako, V.K., Idohou, R., Assogbadjo, A.E. and Glèlè Kakaï, R.	329
Sub-theme 4: <i>Sustainable environment and natural resources management</i>	
Comparison of the perceived and “unseen” value of trees in Kamuli district, Uganda Atugumya, A.B. and Isabirye, M.	335
Characterisation of Baobab in selected wild populations in Malawi Jenya, H., Munthali, C.R Y. and Luhanga, J.	341
Building capacity for sustainable baobab leaves production in Benin Assogbadjo, A.E., Glèlè Kakaï, R., Idohou, R. and Salako, V.	349
Influence of mountainous ecosystems in the production of Arabica coffee: A review Cherukut, S., Karungi, J., Tumuhairwe, J.B. and Bonabana-Wabbi, J.	355
Diversity and utilization of selected edible indigenous fruit trees in Northern Uganda Ogwali, H., Agea, J. G. and Okullo, J. B. L.	361
Sub-theme 5: <i>Sustainable intensification within smallholder crop value chains</i>	
Pathways to secure smallholder farmer seed security Okori, P., Charlie, H., Munthali, W., Kachulu, L., Sichali, F., Elirehema, S., Soka, C., Monyo, E. and Siambi, M.	371
Demand for African indigenous vegetables and seed in Uganda Kansiime, K.M., Karanja, K.D. and Alokit, C.	381

Genetic variation in Durum wheat in N-use efficiency and heritability of traits at different N fertilizer levels of application Belay, M., Dessalegn, T. and Bayu, W.	389
Diversity of sorghum in farmers' fields in Northern and Eastern Uganda Apunyo, P.C., Businge, M., Otim, M., Isubikalu, P. and Odong, T. L.	397
Evaluation of mungbean spacing for adaptability in smallholder cropping systems Ajio, F., Talwana, H. and Kagoda, F.	403
Factors influencing on-farm common bean productivity in Manyara region in Tanzania Saimon, V.K., Mshenga, P. and Birachi, E.A.	407
Consumers' knowledge and preferences for organic vegetables in Tanzania Sendewa, D. D., Elepu, G. and Temu, A.	417
Effect of germination and sodium hydroxide treatments of sorghum cultivars on protein digestibility Melingasuk, M., Gibreil, S. and Abdal-Hafiz.	423
Sensitivity of cereals-maize simulated yields to biogeochemical components Mwazembe, D.J., Ankumah, R., Rwehumbiza, F. and Kajumla, S.M.	431
Adoption and welfare effects of integrated soil fertility management technology among smallholder maize and pigeon pea farmers Sanka, M. B., Diiro, M.G. and Hillbur, P.	437
Invasions by insects in Mozambique – a threat to agricultural production and food security Cugala, D., Miguel, O., Massamby, A., Santos, L. and Sidumo, A.	445
A comparative study of two sampling approaches for the coconut whitefly and its associated parasitoids in Inhambane province, Mozambique Kityo, R. and Cugala, D.	451
Prevalence of Varroa mite infestations among honey bee colonies in Uganda Namayanja, D., Akol, A.M. and Kugonza, D. R.	459
Effect of cultivar and thermotherapy combined with meristem-tip culture on eliminating prevalent viruses infecting potato in Uganda Waswa, M., Kakuhenzire, R. and Ochwo-Ssemakula, M.	467

Pathogenicity of pineapple heart rot disease causal organisms in Central Uganda Ocwa, A., Bua, B. and Tusiime, G.	475
Distribution of maize lethal necrosis disease, its causal viruses and alternatives hosts in north – central regions of Tanzania Mariki, A., Oresanya, A., Munissi, S., Bekunda, M., Ssemakula, M.O. and Kumar, P. L.	483
Plant extracts and antagonistic fungi as alternatives to synthetic pesticides in management of fungal diseases of tomato Lengai, G. M. W., Muthomi, J. W., Wagacha, J. M. and Narla, R. D.	489
Biopesticide-based IPM systems to reduce synthetic pesticide residues in vegetables for niche market access by small holder growers Muthomi, J. W., Lengai, G. M. W., Fulano, A. M., Wagacha, J. M., Narla, R. D. and Mwang'ombe, A. W.	495
Optimum application rates for naturally occurring entropathogenic fungus for termite management in maize fields Khaenje, A. W., Gohole, L. S., Maniania, N. K. and Ngode, L.	503
Managing faba bean diseases using bioinoculants in Northern Ethiopia Gebremedhin, D., Meles, K. A. and Asefa, D.	509
Relationship between causal pathogens of ear rots and grain yield in maize in Uganda Alunga, J.C., Tusiime, G., Asea, G., Gibson, P. and Kwemoi, D. B.	513
Bacterial leaf streak disease of rice: A silent constraint to rice production in Uganda Andaku, J. L., Tusiime, G., Tukamuhabwa, P. and Onaga, G.	523
Evaluation of the response of rice genotypes to bacterial leaf streak disease in Uganda Kanaabi, M., Tukamuhabwa, P., Tusiime, G. and Lamo, J.	529
Sources and inheritance of resistance to sesame webworm in Uganda Matina, G.D., Anyanga, W., Karungi, J. T., Biruma, M., Edema, R., Gibson, P. and Rubaihayo, P.	537
Applications and benefits of marker-assisted introgression of the opaque-2 gene in quality protein maize breeding Maibvisira, N. A., Tarekegne, A. T., Gasura, E. and Maphosa, M.	545
Identification of Turcicum leaf blight resistance genes in sorghum using comparative genomics Mayada, B.M., Manthi, S., Okori, P. and Odeny, D. A.	551

Evaluation of biochemical components as a mechanism of cassava resistance to whitefly infestation in Uganda Mwila, N., Rubaihayo, P., Kyamanywa, S., Odong, T., Nuwamanya, E. and Mwala, M.	557
In vitro techniques for elimination of viruses causing cassava mosaic disease and cassava brown streak disease Okori, J. B. and Nakabonge, G.	567
Integrated management of <i>Orobanche crenata</i> in faba bean in Ethiopia Brhane, T., Kiros-Meles, A., Chala, A. and Asefa, D.	575
Response of local and improved cowpea varieties to Rhizobia inoculation and phosphorus in West Nile region of Uganda Nyamaizi, S., Olupot, G., Tumuhairwe, J.B., Amayo, R., Obaa, B. B. and Tereka, E.	583
Socio-economic factors affecting technical efficiency of potato production in Kenya Chepkwony, E., Korir, M. and Kipsat, M.	589
Determinants of adoption of potato production in the low land areas of Uganda Kyanjo, L.J., Mugisha, J. and Bagamba, F.	595
Soil chemical and maize yield characteristics cost effectively improved by selected organic and inorganic amendments on Sodic soils in Zimbabwe Musekiwa, N.B., Chitata, T., Angombe, S., Mhindu, R.L. and Munodawafa, A.	601
Maize yield in Sudan as influenced by inorganic and organic fertilizers Lubna, M. M., Sayda, A. M. A., Nagat, A. M. E., Ala, A. A. A. and Nura, A. E. A.	609
Morphological variation of baobab fruits and seeds traits in smallholders farming systems in Benin: a preliminary study on baobab leaves production Hounsou-Dindin G., Assogbadjo A.E., Idohou R., Salako V.K. and Glèlè Kakaï, R.	613
Household nutritional knowledge, attitude and practices associated with consumption of wild fruits and vegetables in Acholi Sub-region of Northern Uganda Okidi, L., Odongo, W. and Ongeng, D.	621
Performance of wild blackberry species in Kenya under conventional production Omondi, K.O., Gesimba, R. M. and Wolukau, J. N.	627

Response to cold stress at reproductive stage of introduced and adapted rice genotypes in Uganda Nyiramugisha, J., Lamo, J., Oloka, B.M., Ongom, P., Gibson, P. and Edema, R.	633
Identification of appropriate production packages for increased African nightshade production in Kisii County, Kenya Nyagari, E.O., Onyango, C. M. and Onwong'a, R. N.	639
Grass seed value chain analysis in the Southern Kenya rangelands of Makueni and Kajiado counties Omollo, E., Wasonga, O. V., Elhadi, Y. A .M. and Mnene, W. N.	645
Value-addition of cereal crop residues for improving the income, nutrition and performance of small-stock of small-scale farmers using low technology oyster mushroom production in Botswana Khonga, E.B., Balole, T. V., Madibela, O. R. and Marumo, D.S.	653
Safflower germplasm evaluation for Botswana conditions Emongor, V. E., Oagile, O., Oarabile, P. and Phuduhudu, D.	659
Evaluation of safflower genotypes under the semi-arid conditions in Botswana Oarabile, P., Emongor, V. E., Oagile, O. and Phuduhudu, D.	665
Farmer practices influencing sweetpotato – soy bean production and rabbit farming in selected sub-counties in Elgeyo Marakwet and Kakamega, Kenya Kebeney, S. J., Kitilit, J., Jepkemboi, C. and Kale, P.C.	671
Cassava characterization for diverse use, and on-farm conservation in Uganda: An opportunity for genetic conservation and food security for rural communities Kalimunjaye, S., Nakabonge, G. and Tumwebaze, S. B.	679
Diversity among African nightshade genotypes in Kenya Wesonga, N. L., Ngugi, K. E., Onyango, M.C. and Nyamongo, D.	687
Factors affecting sweetpotato production and soil fertility challenges among smallholder farmers in Kenya Jepkemboi, C., Kebeney, S. J. and Kitilit, J.	695
Productivity of Solonum potato varieties and their yield responses to nitrogen fertilizer application rates in Eastern Rwanda Karemangingo, C.	707
Effects of combining in-situ rainwater harvesting technologies and organic manure on soil moisture and maize performance in Morogoro, Tanzania Balilemwa, J.J., Mugwe, J., Mwetu, K. and Tarimo, A. K. P. R.	715

Status of water quality in the springs of Huye Town, Rwanda Kasanziki, C.M. and Anyemedu, F.	717
Impact of soil and water conservation improvement on the welfare of smallholder farmers in Southern Malawi Maguza-Tembo, F., Edriss, A.K. and Mangisoni, J.	725
Sub-theme 6: <i>Sustainable intensification within smallholder livestock value chains</i>	
Sero-epidemiology of Peste des petits ruminants infection and the associated risk factors in South Kivu, Democratic Republic of Congo Bwihangane, B.A., Misinzo, G., Sviteck, N., Bebora, L.C and George, C.G.	737
Effect of feeding tannin cultivars on broiler chicks' performance Melingasuk, M., Gibreil, S. and Abdal-Hafiz	747
Growth and carcass traits in broiler chicken fed on low-tannin grain sorghum in Kenya Mburu, J. N., Gicheha, J. G., Kabuage, L. W., Njonge, F. K. and Owino, W. O.	755
Assessment of indigenous chicken production in Western Kenya Tarus, J. K., Rachuonyo, H.A., Omega, J. A., Ochuodho, J.O., Gohole, L. S., Owiro, N.O., Ooko, L.A., Okello, E.O. and Munyasi, J.W.	763
Indigenous chicken production and the challenge of mycotoxin contamination Rachuonyo, H.A., Ochuodho, J.O., Munyasi, J.W., Owiro, N.O., Tarus, J. K., Ooko, L.A., Okello, E.O., Omega, J.A. and Gohole, L. S.	771
Strengthening quality protein maize development and utilisation for indigenous chickens in Zimbabwe Gasura, E., Tarekegne, A., Maphosa, M., Maibvisira, N. A., Bidi, T.N., Ncube, S., Dube, A.B. and Saidi, P.	781
Morphological characteristics of indigenous cattle in Eritrea Goitom, S., Gicheha, M. G. and Teclehimanot, G.	787
Production and potential utilization of crop residues and agro-industrial by-products in ruminant nutrition in Eritrea Eyob, H., Njonge, F. K., Goitom, A. and Gicheha, M.	793
Random regression analyses using B-spline functions to model the growth of large white pigs Ouko, V.O., Ilatsia, E.D., Rachuonyo, H.A., Kios, D. K. and Oduho, G. O.	799

Community perception of importance, trends, and variations of indigenous grasses in Southern Kenya Ndung'u, P. L. N., Wasonga, O.V., Mnene, W. N., Koech, O.K. and Elhadi, Y. A. M.	807
Fodder production for enhanced pastoral and agro-pastoral resilience in the drylands of Southern Kenya Wasonga, O.V., Ngoyawu, W. M. and Elhadi, Y.A.M.	819
Genetic diversity of <i>Mycobacterium tuberculosis</i> drug resistance and atypical mycobacteria in Rwanda Uwimana, I., Bwanga, F. and Umabyeye, A. N.	827
Sub- theme 7: <i>Marine science and blue economy - fisheries and aquaculture</i>	
Socio-economic and profitability of fisheries enterprises: The case of Fincha Amarti Nashe reservoir of Oromia State, Horo Guduru Wollega zone, Ethiopia Keno, B. and Zewdie, A.	835
Economic analysis of small-scale fish farming in Bunda, Lilongwe, Malawi Mussa, H., Kaunda, E. and Banda, L.	855
Sectorial appraisal of investor and consumer uptake potential for polychaete culture enterprises along the Kenyan coastline Kihia, C. M., Muthumbi, A., Munguti, J., Muli, B. and Ombati, T.	861
Ecological impacts of common carp and the African sharptooth catfish: A review Chirwa, E. R., Jere, W., Mtethiwa, A. and Sikawa, D.	869
Growth performance of African sharptooth catfish hatchlings fed enzyme pre-digested dry diets from first feeding Kemigabo, C., Kang'ombe, J., Jere, W. L., Sikawa, D. and Masembe, C.	885
Effect of incubation water flow rate and egg population density on hatching success of <i>Oreochromis karongae</i> Valeta, J., Likongwe, J., Kassam, D., Maluwa, A. and Zidana, H.	893
Recruitment pattern and abundance of the black tiger shrimp in Andoni River System, Niger Delta region of Nigeria Komi, W. G. and Amiye, F.	901
Effects of polychaete based diets on growth and survival of Tiger shrimp juveniles Muli, B. M., Kihia, C., Fulanda, B. M., Munguti, J. and Muthumbi, A.	907

Using a molluscivorous cichlid from Lake Malawi as a biological control agent of schistosomiasis snail hosts 913
Jere, W.W. L., Kanthenga, H., Lusangasi, B., Makuya, C., Sausa, T. and Singini, W.

Sub- theme 8: *Reducing postharvest losses*

Nutritive value of cooking melon from diverse processed products as energy source for livestock 917
Madibela, O. R., Basutli, O. and Masebu, H.

Effect of pre-treatments and drying on nutrient content of orange fleshed sweet potatoes in Maswa district, Tanzania 923
Nicanuru, C., Laswai, H. S. and Sila, D. N.

Pre and post-harvest management practices of groundnut production and their implication to aflatoxin management in Tigray, Ethiopia 931
GebreEgzabher, H., Tadesse, T., Assefa, D. and Tsegay, A., Meles, K., Abrha, B. and Tsehaye, Y.

Microbiological quality and storage stability of fresh fruit and vegetable juice blends sold in Kampala, Uganda 937
Kaddumukasa, P. P., Mathara, J.M., Imathiu, S.M. and Nakavuma J.L.

Strengthening rural households hygiene and sanitation in developing countries using locally available resource: *Aloe vera* soap production in Negash Kebele, Tigray, Ethiopia 943
Kidu, G., Gebremicheal, B., Muruts, H. and Gebregziabher, D.

Sub-theme 9: *Agricultural marketing pathways, product uptake, trade and policy*

Effectiveness of mobile phone supported market information dissemination in promoting Agricultural marketing in Northern Uganda 945
Apili, J. A., Jemal, Y. and Ongeng, D.

Extent of commercialization of indigenous chicken production in Northern Uganda 951
Aryemo, I. P., Kule, E., Kugonza, D.R., Okot, M.W. and Mugonola, B.

A review of the nutritive value and utilisation of quality protein maize in indigenous chicken production. 957
Bidi, T.N., Ncube, S., Dube, A.B., Gasura, E. and Saidi, P. T.

Nutritional quality of soy fortified complementary flours from Western Kenya 963
Kamau, E.H., Wamunga, F.W. and Serrem, C.A.

Formulation of infant foods fortified with baobab fruit pulp and moringa leaf powder for children under five Affonfere, M., Chadare, F.J., Madode, Y.E., Nago, E.S.H., Houndji, S. and Azokpota, P.	969
Effect of consumption of foods fortified with baobab fruit pulp and moringa leaf powder on the nutritional status of children Agossadou, J.O., Chadare, F.J., Nago, E., Houndji, S., Madode, Y.E., Moumouni, M. I. and Hounhouigan, D.J.	979
Traditional use of moringa leaves and baobab pulp as fortificant in mother and children feeding in Benin Chadare, F.J., Nago, E. S. H., Madode, Y.E., Houndji, S. and Moumouni, M. I.	989
Improving protein and micronutrient quality of cassava meal for primary school feeding in Uganda Elolu, S., Mugonola, B., Muyanja, C.K. and Ongeng, D.	997
Potent inhibitors of iron bioavailability in germinated maize used for complementary feeding in Tanzania Mihafu, F.D., Bovell-Benjamin, A.C. and Laswai, H.S.	1005
Economic viability and competitiveness of processed cassava products among rural women in north and north eastern Uganda Ajok, W., Ongeng, D. and Mugonola, B.	1013
Sensory properties and consumer acceptability of nutrient dense porridge from locally available foods for infants in Tanzania Marcel, M., Turyashemererwa, F., Mukisa, I. and Mongi, R.	1019
Physico-chemical, microbiological and sensory qualities of probiotic yoghurt enriched with baobab pulp Aluko, A., Kinyuru, J., Chove, L. and Owino, W.	1027
Evaluation of nutritional quality of safflower for use as animal feed Phuduhudu, D., Emongor, V. E., Oagile, O. and Oarabile, P.	1037
Application of edible insects in enriching complementary foods made from common plant sources Mmari, M., Kinyuru, J. N., Laswai, H. S. and Okoth, J.	1043
Development of a millet-sesame-soy complementary food composite for rural communities Nassanga, P., Okello-Uma, I. and Ongeng, D.	1051
Effect of amylase activity in germinated maize flour on viscosity, energy and nutrient density of complementary porridge Yaredi, P., Nabubuya, A. and Msuya, J.	1059

Development and assessment of nutritional quality and sensory properties of orange-fleshed sweetpotato and bambara groundnut-based snacks for school children Buzo, H., Mongi, R. J. and Mukisa, I. M.	1067
Design and simulation of an integrated solar cooker -dryer system Ahumuza, A., Zziwa, A., Kambugu, R., Komakech, A. J. and Kiggundu, N.	1075
Performance evaluation of self-propelled sesame harvesting cutter binder under Gedarif farming conditions, Gedarif State, Sudan Elebaid, J. I., Abdalla, S. A. and Osama, A.M.	1085
Mechanised multi-row seeding of finger millet Muyingo. E., Tenywa, J. S. and Kiggundu, N.	1095
<i>Sub-theme 10: Strengthening gender mainstreaming to enhance agricultural productivity</i>	
Factors affecting academic performance of female students at Mekelle University, Ethiopia Gebrehiwot, D.B., Teklay, A. and Kebede, T.	1107
Positioning rural women agri-entrepreneurs to address short-term hunger and undernutrition in rural primary schools in Uganda Ongeng, D., Mugonola, B. and Mayanja, C.	1115
Gender based impacts of climate change and adaptation strategies in Raya Azebo district, Tigray Region, Ethiopia Negasi, M.	1123
<i>Sub-theme 11: Addressing risk associated with climate change variability in agricultural systems</i>	
Assessing local community perceptions on climate change and variability on crop production in Western Oromia, Ethiopia Daba, M.	1129
Improving resilience of rural women to climate change in Western Sudan Mohammed, A. A. H., Muna, A. and Elshiekh, A. I.	1139
Determinants and impact of climate smart agriculture technology adoption on the welfare of smallholder farmers in Malawi Magaza-Tembo, F., Edriss, A. and Mangisoni, J.	1147
The atmospheric deposition of phosphorus and nitrogen on Lake Kivu Bagalwa, M., Majaliwa, M., Kansime, F., Bootsma, H.A., Karume, K. and Mushagalusa, N.	1159

The role of environmental education in soil conservation and
management in Rakai district Uganda
Nassuna. J. and Egeru, A.

1171

EDITORIAL

The latest research shows that we really should do something with available research outcomes: overcoming the “Valley of Death” to enhancing commercialization of research outputs

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Abstract

This article was inspired by a dialogue that transpired during the 5th All Africa Higher Education Week and Biennial Conference of the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), held in October 2016. The conference gathered over 850 participants from 72 countries and is usually a convening event that brings together several stakeholders in the two key sectors of Higher Education and Agriculture. The theme was “Linking Agricultural Universities with Civil Society, the Private Sector, Governments and other Stakeholders in support of Agricultural Development in Africa”. From the seven plenary sessions and 49 parallel/side meetings a key concern that strung through all the deliberations was that of the “valley of death” (also referred to as translational research) in relation to enhancing the usability of research outputs by translating knowledge to practice. It was apparent that the stakeholders in attendance was a good mix, in terms of the different walks of life, designation and vocation, for articulating the urgency of moving research outputs from bookshelves to application in the hands of end-users. The observation was that there is limited application of otherwise useful research-generated interventions to key challenges in Africa’s agri-food systems. This Volume 14 (2) of The RUFORUM Working Document Series, (a peer-reviewed serialized publication, ISSN 1607-9345), features 147 articles accepted for publication mainly from university-based research and clearly if a fraction of the recommendations were put to use there would be less hunger and poverty in Africa than is currently the case. Apparently, there is not just one death valley but for any give technology and/or intervention to reach the end-user (s) there are many potential death-valleys between research and outcomes. In light of this, the convening considered a different conceptualization of knowledge translation (KT) as a dynamic and interactive process that includes synthesis, dissemination, exchange and ethically sound application of knowledge to improve uptake on interventions and thereby strengthen livelihoods. It is widely recognized that the process of KT takes place within a complex system of interactions between researchers and knowledge users which may vary in intensity, complexity and level of engagement depending on the nature of the research and the findings as well as the needs of the particular knowledge user. This Editorial provides selected actions among others that would help unlock the inertia from knowledge to practice, and enhance research-into-use practices in an innovation ecosystem.

Key words: Africa, Higher Education Week, innovation ecosystem, knowledge translation, research-into-use, translational-research

Résumé

Cet article a été inspiré d'un dialogue lors de la 5^{ème} Semaine africaine de l'enseignement supérieur et de la Conférence biennale du Forum Régional des Universités pour le Renforcement des Capacités en Agriculture (RUFORUM), qui s'est tenue en octobre 2016. La conférence a réuni plus de 850 participants de 72 pays, et est en général un événement de mobilisation qui réunit plusieurs acteurs de deux secteurs clés ; l'enseignement supérieur et l'agriculture. Le thème était "Mettre en relation les universités agricoles avec la société civile, le secteur privé, les gouvernements et les autres parties prenantes pour le soutien du développement agricole en Afrique". Sur les sept séances plénières et 49 rencontres parallèles, la préoccupation majeure assortie de toutes les délibérations était celle de la « vallée de la mort » (également appelée recherche translationnelle) en ce qui concerne l'amélioration de l'utilisation des résultats de recherche par la conversion des connaissances en pratiques. Il est évident que le mélange des acteurs présents à cette rencontre était bien varié, en termes de modes de vie, de désignation professionnelle et de vocation, pour articuler l'urgence du transfert des résultats de recherche des rayons des bibliothèques en application dans les mains des utilisateurs finaux. L'observation était qu'il y a une application limitée des interventions utiles générées par la recherche aux défis majeurs des systèmes agroalimentaires africains. Ce volume 14 (2) de la série de documents de travail du RUFORUM (une publication sérialisée à comité de lecture, ISSN 1607-9345) comporte 147 articles acceptés pour publication principalement à partir de recherches universitaires ; et clairement si une fraction des recommandations avaient été mises à profit, Il y aurait moins de famine et de pauvreté en Afrique que ce n'est actuellement le cas. Apparemment, il n'y a pas qu'une seule "Vallée de la Mort", mais de nombreuses "vallée de la Mort" potentielles entre la recherche et les résultats pour qu'une technologie et /ou intervention donnée atteigne l'utilisateur final. À la lumière de cela, la mobilisation a considéré une conceptualisation différente d'application des connaissances (AC) comme un processus dynamique et interactif qui comprend la synthèse, la diffusion, l'échange et l'application éthique approfondie des connaissances pour améliorer l'adoption des interventions et ainsi renforcer les moyens de subsistance. Il est largement reconnu que le processus du AC se déroule dans un système complexe d'interactions entre les chercheurs et les utilisateurs de connaissances qui peuvent varier en intensité, en complexité et en niveau d'engagement en fonction de la nature de la recherche et des résultats ainsi que des besoins de chaque utilisateur de connaissances. Cette édition fournit entre autres des actions sélectionnées qui aideraient à débloquer l'inertie des connaissances à la pratique et à améliorer l'utilisation des pratiques de la recherche dans un écosystème d'innovation.

Mots clés : Afrique, Semaine de l'enseignement supérieur, écosystème d'innovation, application des connaissances, utilisation de la recherche, recherche-translationnelle

Introduction

The Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), a Network of universities in Africa organizes as part of rolling out its functions and mandate an Africa-wide week long convening event. The convening, dubbed “Africa Higher Education Week and RUFORUM Biennial Conference” represents one of the most comprehensive events for actors in higher education and agricultural sectors (Nampala *et al.*, 2016). The RUFORUM dedicates this convening to fostering networking among its member universities and to link universities to other actors and stakeholders in the two sectors that relate to the Network mandate and interest, i.e., Higher Education and Agricultural sectors. At each convening, a dedicated theme is selected to serve as the nub for dialogue and agenda for action. During the 2016 Fifth Higher Education Week and RUFORUM Biennial, held 17 - 21 October 2016 in Cape Town, South Africa, the selected theme was “Linking Agricultural Universities with Civil Society, the Private Sector, Governments and other Stakeholders in support of Agricultural Development in Africa” (RUFORUM, 2016). This is a topical theme in contemporary development contexts, and for this reason, the convening attracted a diversity of stakeholders including representatives from policy-decision making, academia, Development Partners, farmers, industry and private sector.

The key note address at the plenary session of the convening on “Linking Universities with the Private Sector for Agribusiness Innovations”, by Her Excellency Mrs. Ammenah Gurib-Fakim, President of the Republic of Mauritius and Guest of Honor highlighted the issue of the “Valley of Death” and challenged the “August Assembly” of the over 850 to address the gaps and enhance translation of research outputs and outcomes to commercialization as part of the broad agenda to better the livelihoods of millions in Africa. The objective of this article therefore is to contribute to this dialogue and give impetus to stakeholders to rise to the call for action with a focus on addressing the “valley of death”.

Definitions: “Valley of Death” and Innovation Ecosystem

The “Valley of Death” is a phrase that has been used in research to describe the fundamental challenge of applying research and development advances to operations. In terms of innovations, the valley of death describes the point where a business, often a technology based business, has a working prototype for a product or service that has not yet been developed enough to earn money through commercial sales. The company needs to find sufficient money to develop the prototype until it can generate sufficient cash, through sales to customers, that would allow it to be self sufficient and grow. Growing companies will generate both jobs and wealth, a key objective for the global economy.

It is a metaphor that illustrates gaps in the translation of laboratory discoveries to end-users delivered through applied research and/ or deployment of innovations for development (Fig. 1). It also recognizes the translation of resulting evidence from research and its

application to practice and policy towards establishment of a sustainable global good and/or service to society (i.e., the innovation and/ or research outcome).

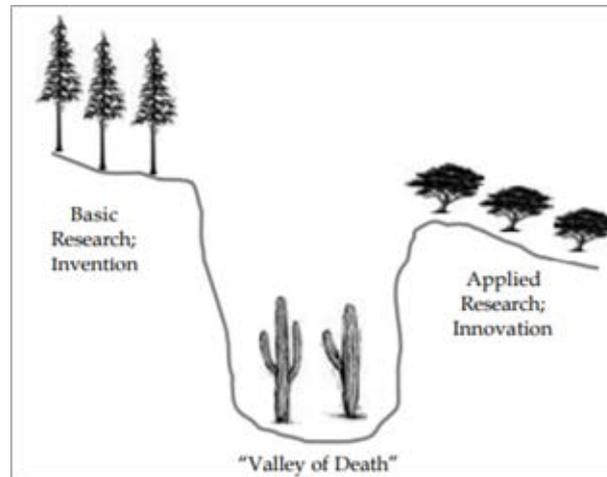


Figure 1. Schematic diagram illustrating the “Valley of Death”

The innovation ecosystem derives from a conceptual analogy with the biological ecosystem. As highlighted in Jackson, (nd) “In the biological system, the equilibrium state is described by modeling the energy dynamics of the ecosystem operations. In this context, the energy is simply the way the predator-prey relationship and the plants transfer energy; calories are burned consuming prey, thereby transferring the energy of the prey to the predator and as plants die and decompose, their energy is transferred to the soil where it is taken up again by other plants. Because the energy dynamics are a complex function, an ecosystem can only be considered as a whole, not piecemeal, as every part of the ecosystem has a functional effect on another. Thus, a biological ecosystem is a complex set of relationships among the living resources, habitats, and residents of an area, whose functional goal is to maintain an equilibrium sustaining state”.

“In contrast, an innovation ecosystem models the economic rather than the energy dynamics of the complex relationships that are formed between actors or entities whose functional goal is to enable technology development and innovation. In this context, the actors would include the material resources (funds, equipment, facilities, etc.) and the human capital (students, faculty, staff, industry researchers, industry representatives, etc.) that make up the institutional entities participating in the ecosystem (e.g. the universities, colleges of engineering, business schools, business firms, venture capitalists (VC), industry-university research institutes, industrial supported Centers of Excellence, and state and/or local economic development and business assistance organizations, funding agencies, policy makers, etc.).”

The innovation ecosystem comprises two distinct, but largely separated economies, the research economy, which is driven by fundamental research, and the commercial economy, which is driven by the marketplace. By design, the two economies are weakly

coupled because the resources invested in the research economy must be derived from the commercial sector. This definition includes government research and development (R and D) investments which are ultimately derived from tax revenues. In order to foster the serendipitous investigations that are essential to innovative discovery, it is also important that the incentives driving the research economy be decoupled from the financial incentives driving the commercial economy.

Valleys of Death and not just one “Valley of Death”

The road between a discovery generated from basic research and invention processes to commercialization of products or processes is long, and in practice, characterized by significant challenges. The “valleys” arise from transitions moving from basic research to implementation research and finally to commercialization/practice research. Researchers, Innovators and Inventors often view the “funding-gap” as the critical limitation and have associated this to constitute the “Valley of Death” at an intermediate stage of the process between basic research/invention to commercialization of a new product/innovation. To the extent that the funding limitations prevail, a new innovation and/ or discovery may never be transformed into a commercial product and the implication will be a diminished return on funding for early stage research for development (Ford *et al.*, 2007). This has implications for the “Research Economy” and “Commercial Economy” as presented in Figures 2 and 3. When the innovation induced growth (i.e., commercialization resources) in profits exceeds the initial R and D investment, there is growth in the innovation ecosystem (Jackson, n.d).

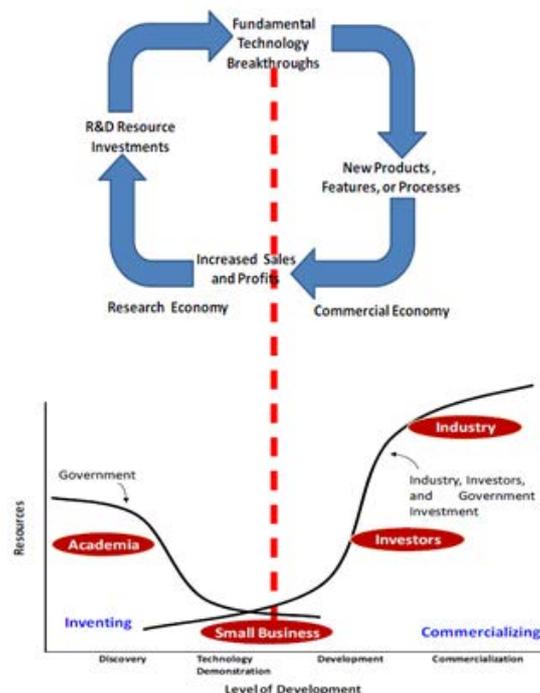


Figure 2. Cyclic process through which Research and Development resource investments are replenished through profitability of a commercialized innovation in a thriving innovation ecosystem

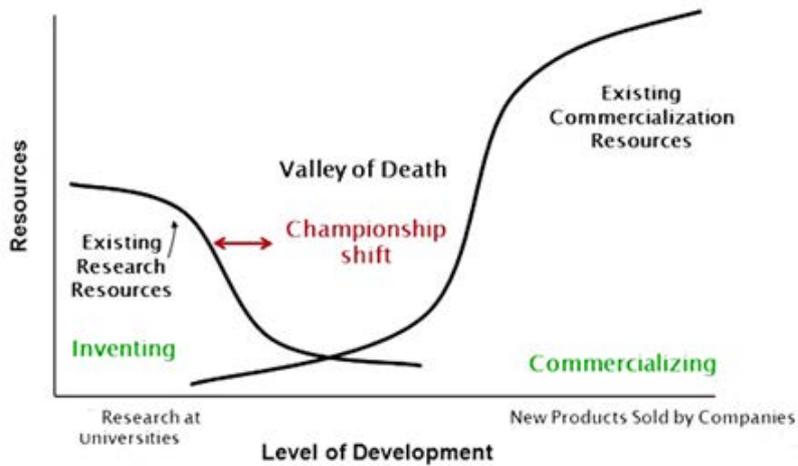


Figure 3. Level of development if a factor of the volume in scale and scope of inventions that cross the challenge basin and move to profit maximization – the shift requires champions

Rationalizing appropriate actions to minimize “Valleys of Death”

Consider technical and cost-effective efficiencies for the entire R and D continuum and not just at the technology development stages: Available literature on research-into-use presents concepts on the “valley of death” based on the traditional investment problems at the intermediate stage where it manifests. While several factors associated with financing including risk, uncertainty, spill-overs, and increasing returns to scale are apparent at intermediate stages and play a catalytic role for the “Valley of Death” to arise. These factors alone cannot explain the presence of a “valley” in the research for development continuum.

Many knowledge transfer and translation approaches promote the linear model of innovation. However, this assumes that there is only a single ‘valley of death’ with the thinking that is a linear process, and that financial obstacles were only found in one place.

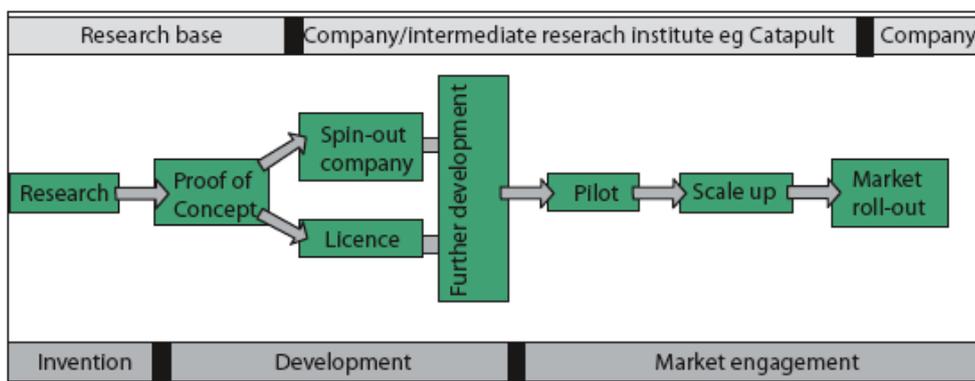


Figure 4. The linear idea of innovation

In practice innovations are generated through a cyclic process with the vast majority of new technologies in the world that become commercially adopted with engagement of several actors along the research for development continuum. The role of researchers/inventors and knowledge institutions may be less instrumental in the commercialisation process than is assumed. Instead the commercialization stage is devised and developed in the business world, by entrepreneurs, technology consultants, large and small businesses and in supply chains (albeit, infused and informed by research-informed ideas and human capital development).

Allow for freedom to fail in the context of nurturing a culture of an innovation ecosystem: The cyclic nature of research for development leading to attainment of an innovation outcome/process implies that for a Valley of Death to manifest at an intermediate stage a noneconomic activity must be apparent in the initial stages. A noneconomic activity refers to investments at initial stages that are not taking into account what happens in later stages of the innovation development, i.e., the tail-end of the research for development continuum. If at the beginning decisions are part of the tail-end decisions which is expected with profit maximization arrangements, then a significant Valley of Death will be envisaged and stemmed from the start. This, however is not the case with the “Research Economy” and, in part underpins the importance of freedom-to-fail on the part of the researchers/inventors in the context of universities and higher education institutions and nurturing the culture of innovation ecosystems. The intended purpose of an invention is usually different from that of the researcher and users. New knowledge builds on old-knowledge and Researchers need the freedom to research technologies that have no hope of commercialization in their lifetime. Similarly, it is prudent for governments and development partners to support basic scientific research to undertake projects solely for the sake of generating new knowledge or at the full discretion of the researcher uninterested in commercial prospects.

Available data from the European Research Council indicates that “Statistically, 50% of the venture capitalists investment portfolios fail outright, 30% are marginal in that they don’t fail, but also don’t experience growth, 10% grow at a rate of about twenty percent a year, and 10% grow fast enough to provide returns in excess of 1000%. Venture capitalists only classify an investment enterprise as successful if its return on investment (ROI) exceeds a factor of 10. The reason venture capitalists require a minimum ten-fold ROI is to ensure that they can recover their investments on the other nine investments that “fail”. Like the venture capitalists, the innovation ecosystem must experience enough earnings growth to recover all investments in the R and D to be considered healthy and thriving.”

The high risk to investors leads to several important conclusions about healthy conditions that define innovation ecosystems. First, the increased productivity from successful enterprises must be profitable enough to compensate for the monetary investment in fundamental research and for the aggregated investment in both the successful and the failed Rand D ventures. Because there is a high probability most enterprises launched in the ecosystem will fail, a healthy ecosystem should also be structured to handle failures

in a way that encourages terminating losing investments early in order to facilitate more efficient utilization of ecosystem resources. Ideally, the ecosystem is structured to efficiently recover and recycle any resources (including human capital) that are released upon the failure of individual enterprises. Because resources within the ecosystem are limited, the dynamics of success and failure within the Valley of Death represents an important mechanism for regulating the consumption of the ecosystem's resources.

Handle intangibles and shift the Valley of Death into a challenge basin: The innovation ecosystem consists of actors (human resources), entities (e.g., institutions, partnerships, policies), and intangibles (mainly corporate intellectual property including items such as patents, trademarks, copyrights, business methodologies, goodwill and brand recognition). There is always more focus on actors and entities and less on the intangible issues/actions and in the process this facilitates the Valley of Death to manifest. The intangibles are “the complex actions that effectively move the valley walls inward and the valley floor upwards in order to replace the deep walled Valley of Death with the gentle slope of a challenge basin” (Jackson, n.d). There is no set recipe for effectively handling intangible issues within an ecosystem because it depends on the specifics of the technology, the cultures of the ecosystem entities, and the personalities of the players. The best way to describe how to approach the development of these relationships is to start by viewing the “valley” in a figurative sense (see Figure 5). In this context, the intangible actions of the innovation ecosystem comprise everything one does to the infrastructure to effectively move the research side of the valley wall further to the right; or to move the commercial side of the valley wall further to the left thereby improving the odds of an innovative venture successfully spans the Valley of Death. For example, training a cadre of champions to shepherd ventures toward commercial success represents a technology push that effectively moves the valley wall to the right.

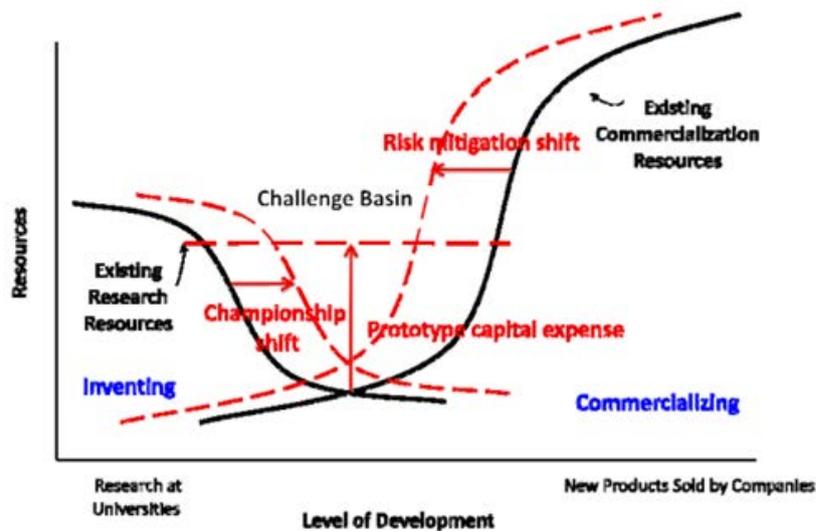


Figure 5. Illustration on narrowing the challenge basin (Valley of Death) to enhance commercialization of research outcomes

Conduct research to make the results applicable to the population under study:

Increased uptake of research outcomes can be achieved through knowledge co-creation processes that should be imbedded in the research design and implementation. According to Wenger (1998), knowledge development is a communicative process which takes place within a shared practice. Therefore, translating knowledge into use should take into consideration the fact that knowledge emerges from and is justified by shared practice and activities among communities and should be contextualized and exemplified as part of the process of sharing. In light of this, the R and D continuum that is designed to promote uptake and commercialization of innovations should embrace models that use collaborative, participatory, action oriented, community-based, engaged scholarship mode to knowledge production. These models will secure end-user engagement in the research process and in the process give end users confidence in the results and in the researchers as well. End-user engagements with multi-disciplinary and transdisciplinary teams also translate into readiness for ownership of results and willingness to adopt effective practices, abandonment of ineffective ones, and moving results to practice and policy (Wit, 2005).

Conclusion

Understanding how advances in basic research are effectively translated into economic growth, a sequence of events involving contributions from several players, from researchers to inventors and investors to customers/consumers, is very critical to maximize potential of the economy. This process that transforms ideas and discoveries into commercial production is described as the “Innovation ecosystem”. It is possible that the “Valley of Death” arises mainly because of a focused attention on basic research and late-stage commercialization of R and D projects with limited attention for projects and programs that are intermediate between basic research and commercialization. The intermediate represents “implementation research” also referred to as translation research and focuses on technology translation gaps and doing research collaboratively with end-users. Implementation research should therefore, entail studying the determinants of knowledge use and effective methods of promoting the uptake of knowledge. Any clarification of the “Valley of Death” must explain why the “valley” is surrounded by “peaks” and respond to the call by Her Excellency Mrs. Ammenah Gurib-Fakim at the 5th All Africa Higher Education Week and Biennial Conference of the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), held in October 2016. It is prudent for the research fraternity to pay equal if not more attention to the Implementation Research agenda between basic research and commercialization projects. Hopefully investments and interventions (particularly the deployment of proven methodologies for uptake) arising from the implementation research in the R4D continuum will offload research outputs from bookshelves and enhance uptake on innovations.

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