



Policy Brief

Scaling Conservation Agriculture for Sustainable Intensification in South Asia

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Organizers

Trust for Advancement of Agricultural Sciences (TAAS)
Australian Centre for International Agricultural Research (ACIAR)
Australian AID
International Maize and Wheat Improvement Center (CIMMYT)



Trust for Advancement of Agricultural Sciences

The Trust for Advancement of Agricultural Sciences (TAAS) was established on 17 October 2002. Its mission is to promote growth and advancement of agriculture through scientific interactions and partnerships. The major objectives are: (i) to act as think tank on key policy issues relating to agricultural research for development, (ii) organizing seminars and special lectures on emerging issues and new development in agriculture sciences in different regions of India, (iii) instituting national awards for the outstanding contributions to Indian agriculture by the scientists of Indian origin, and (iv) facilitating partnerships with non-resident Indian agricultural scientists. The main activities include organizing foundation day lectures, special lectures, brain storming sessions/ symposia/seminars/ workshops on important themes, developing strategy papers on key policy matters, promoting farmers' innovations and conferring Dr. M.S. Swaminathan Award for Leadership in Agriculture. For more details, please visit: www.taas.in



Australian Government
Australian Centre for
International Agricultural Research

Australian Centre for International Agricultural Research

ACIAR is an Australian Government statutory authority within the Foreign Affairs portfolio. It is Australia's specialist agency for international agricultural research for development (R4D). It supports applied research to improve agricultural productivity and sustainability and helps building food system resilience. ACIAR's activities are concentrated primarily in the Indo-Pacific region. Farmers, rural poor, researchers and policy makers benefit from ACIAR's projects and programs. ACIAR brokers and funds research partnerships between Australian scientists and their counterparts in developing countries. For more details, please visit: www.aciar.gov.au



The Australian Aid Agency for International Development (AusAID) is the Australian Government agency mandated for managing Australia's overseas and program. AusAID is an executive agency within the Foreign Affairs and Trade portfolio. The chief goal of AusAID is to contribute to sustainable economic growth and poverty reduction. It extends financial assistance to NGOs (and the government and other institutions). For more details, please visit: www.dfat.gov.au/aid



International Maize and Wheat Improvement Center

International Maize and Wheat Improvement Center (known by its Spanish acronym, CIMMYT) is a not-for-profit agriculture research and training organization. The Center works to improve food security and livelihoods by sustainably increasing the productivity of maize and wheat in the developing world. CIMMYT maintains the world's largest maize and wheat seed bank and is best known for initiating the Green Revolution, which saved millions of lives across Asia and for which CIMMYT's Dr. Norman Borlaug was awarded the Nobel Peace Prize. CIMMYT is a member of the CGIAR Consortium and receives support from national governments, foundations, development banks and other public and private agencies. For more information visit: www.cimmyt.org

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Preamble

Realizing the importance of conservation agriculture (CA) and its scope in South Asia (SA), a high-level policy dialogue on scaling Conservation Agriculture for Sustainable Intensification (CASI) was jointly organized by the Australian Centre for International Agricultural Research (ACIAR) and the Trust for Advancement of Agricultural Sciences (TAAS) on 8-9 September 2017 in Dhaka, Bangladesh. The CIMMYT and the sustainable and resilient farming system intensification (SRFSI) project of the Australian supported Sustainable Development Investment Portfolio (SDIP) in South Asia facilitated its organization. In all, 64 participants, including high-level policy planners, senior NARS leaders, research leaders and senior scientists of the CGIAR centres, research institutions, development officials, private sector representatives, NGOs, donors and some progressive farmers, from 5 out of 8 countries from South Asia contributed in drawing useful recommendations from this Policy Dialogue.

The Policy Dialogue was the first opportunity in many years to exchange information on CASI across the whole region for assessing regional priorities and for defining a roadmap for scaling CA-based sustainable intensification in South

Asia. The primary goal of the dialogue was to review the progress and the state of the CASI in South Asia and to explore way outs to move forward on scientific, institutional and policy fronts to catalyze transformative actions on scaling the CASI. Based on the formal presentations on the scientific developments on the CASI, specific deliberations on the development and policy-related issues and also the panel discussion on possibilities of scaling CASI, a Road Map has been suggested for its effective implementation.

The Regional Scenario

The South Asia is an agriculturally vibrant region. It has witnessed Green, White and Blue Revolutions in the recent-past. The region is home to many influential civilizations. It is endowed with rich agro-biodiversity, but is exposed to recurring incidences of natural disasters, like droughts, floods and cyclones. South Asia is also the most populous (1.87 billion) and densely populated region of the world (330 persons/km²) (www.worldmeters.info). Despite these odds, it enjoys a high rate of economic growth. But the region still reels under the scourge of extreme poverty (42%) and malnutrition (21%), which are among the important agenda of the sustainable development goals (SDGs).

In South Asia, there is hardly any scope for horizontal expansion of farm area. Yet the region would need 70% more food by the year 2050 to meet the projected demand. In fact, the future food security in South Asia has twin challenges of degrading natural resources and decelerating productivity growth of food grains. The challenges are exacerbated further owing to sharp rise in the cost of inputs, including energy, depleting water resources, soil degradation, indiscriminate and imbalanced use of chemical fertilizers and above all adverse effects of global climate change, which are likely to affect crop yields by 7-10%. Therefore, deployment of tools, techniques, practices and strategies aiming at increasing agricultural production and using technologies, which would address degradation of soil, water and environment and ensure their rational use, are essential for sustainable growth of agriculture in the region.

The Core Issues-Soil, Water and Environment

Despite the success of Green Revolution (GR), the larger challenge of feeding an increasing population from non-expandable arable land is putting tremendous pressure on and is resulting in overexploitation and degradation of natural resources. Intensification of agricultural production through cereal after cereal cycle is no more sustainable. The productivity growth rates of both rice and wheat have declined almost to one half of the initial peak rate during the last two decades in South Asia. This drop is a consequence of deterioration in soil-health and input-use efficiency, drying of aquifers, rise in greenhouse gas (GHG)

emissions and global warming, and fall in soil-organic carbon (SOC). Additionally, spread of nutrient deficiencies of Zn, Mn, B and K, unknown earlier, has depressing influence on the crop productivity. Over the last 6 decades, besides deterioration in the ability to act as sink for carbon (C) and a storehouse for nutrients and water, the ability of soil has also been dented in regulating the climate. Apart from a faulty soil management practice like intensive tillage, increase in crop residue burning lately has also become a major contributor to CO₂ emissions. Additionally, this senseless incineration weakens soil physical, chemical and biological quality attributes.

Influence of the above listed adversaries fueling unsustainable intensification is maintained because of: (i) existing imperfections in public policy on subsidizing agrochemicals, power and tillage, (ii) exclusion of natural resources conservation and role of stakeholders from the development agenda and (iii) prevalence of institutions and scientists conducting component-based individual researches in place of system-wide multi-partner holistic enquiry in real-life farms, farmers and farming situations. A priori condition would be the holistic management and more efficient resource use to protect health of soil, quality of water and condition of environment on which the growth of the human-beings depends.

Options for Sustainable Agriculture

Sustainable intensification, as well as contributing to food security,

optimizes productivity with efficiency and competitiveness. Apparently, sustainable intensification requires a holistic approach around the following:

- **Conservation agriculture (CA):** CA is characterized by three linked principles– (i) continuous minimum mechanical soil disturbance, (ii) permanent organic soil cover and (iii) diversification of crop species.
- **Integrated nutrient management (INM):** INM comprises right management of fertilizers and biological processes such as organics, mulching and microorganisms to provide and recycle nutrients to sustain productivity growth without adverse ecological consequences.
- **Integrated pest management (IPM):** IPM reflects an integrated approach for containing pests (diseases, insects and weeds) below the economic threshold using cultural methods, resistant varieties, habitat manipulations and minimal pesticide use.

Hence, CA aims at yield optimization in a more sustainable way, while reducing cost on inputs like energy, water, labour, nutrients, etc. According to FAO (<http://www.fao.org/agriculture/crops/core-themes/theme/spi>) estimates, GHG emission with CA cutback was equal to savings in fuel by 40-70%; input manufacturing like biological processes replacing functions of machinery by 50%; fertilizer use by 30-50%; and pesticides use by 20%. Adoption of all elements of CA is necessary to have economic and environmental benefits.

Initiatives on Conservation Agriculture (CA)

The concept of CA to save land from adverse consequence of erosion was adopted in the USA as early as in 1930s. Thereafter, the concept spread to Brazil, Argentina and other parts of the world.

In South Asia, the concept of CA got attention during mid-nineties when the Rice-Wheat Consortium (RWC) for the Indo-Gangetic Plains was launched, involving India, Pakistan, Nepal and Bangladesh. It was initiated in a collaborative mode by the World Bank, involving all the four National Agricultural Research Systems (NARS), and was facilitated in turn by the ICRISAT, CIMMYT and IRRI. Being a unique ecoregional program, additional funding support was also provided by the USAID, ACIAR and ADB to the RWC. Through facilitation by the RWC by 1999-2000, zero-till wheat was practiced in about 10,000 ha. In 2002, RWC and its collaborators helped introduction of second generation zero-till seed drill. This development stimulated adoption of CA further, and contributed to rise in area under CA to 2.2 m ha in 2004-05. Of late, CA spans on an area of 5.0 m ha in South Asia; ~75% in India, ~20% in Pakistan and remaining 5% in both Bangladesh and Nepal. Additionally, emphasis on the laser land levelling strengthened significantly the impact of CA practices. Impressed by the success of the RWC across South Asia region, as a unique ecoregional program in South Asia, the CGIAR conferred upon it the prestigious King Baudouin Award.

Concerns on Slow Spread of CASI

Despite impressive growth in acreage, barely 2% of the arable land (210 million ha) in South Asia is presently under CASI. Moreover, there are very few instances of acceptance of full CASI practices; mostly it was the adoption of 'zero-till' practice and that too confined to wheat and lately to maize. The practice of puddled rice remains a big hindrance, since surface presence of crop residue inconveniences cultivation of a submerged field (puddling). On the other hand, despite the proven superiority of CASI in rainfed areas (around 60% area in India), it continues to be grossly underutilized in South Asia. Majority of the South Asian farming community persists with the clean cultivation, and hence is reluctant to believe in the efficacy of sowing in a straw-mulched land surface. Even the extension functionaries have limited knowledge on scientific, economic and environmental benefits of CASI. As a result, CASI rarely forms part of the packages of practices. Moreover, CASI demands farmers' participatory research approach, which remains largely neglected. Resultantly, CASI thus far did not get the needed attention for R&D funding and policy support that it deserved despite the availability of credible evidence on the economic and environmental benefits of CASI practices. Also, CASI research in the past was mainly focused on rice-wheat irrigated system. The present need is for diffusion and adoption of CASI in irrigated upland and rainfed ecologies. Above all, CASI is more than a cost-cutting technological option, as it leads to sustainable intensification, while providing

environmental services as national public good. Notwithstanding, CASI spread continues to be rather slow and thus requires a major policy thrust and that too in a Mission Mode.

Road Map for Scaling CASI

- i. Conceptually, CASI is not a single technology. It is an innovation for sustainable farming, assimilating effective germplasm/crops, integrated nutrient/pest management, minimal and efficient farm mechanization, and efficient soil and water management practices. Therefore, it requires application of **farming system' related coherent interventions** that would increase both income and adaptive capacity of farmers for diversified as well as resilient agriculture. Additionally, its infusion is seen to sustain ecological services and in providing greater environmental benefits to the countries of the region. Hence, CASI being a national/regional/international public good, it needs to be outscaled to reap multidimensional benefits.
- ii. Farmers in South Asia are predominantly small and marginal with a limited risk taking ability. Hence, outscaling of CASI principles has to adopt **farmers' participatory approach**, requiring on-farm research, validation, refinement and faster adoption methodology.
- iii. Noticeably, the complexity of scaling CASI related innovations calls for **inter-disciplinary and inter-institutional collaboration**. Thus, it necessitates combined action by

the drivers of change – farmers, scientists, development officials, NGOs, entrepreneurs and the policy-makers. For this, a ‘Mission Mode’ program/ approach is warranted urgently for joint regional action to have the needed impact on scale.

- iv. Given the intricacy of the process to effect change in soil and crop management practices, scientists, engineers and extension workers (both public and private) would need to impart knowledge to practitioners (farmers) regarding CASI principles and practices without any dissemination losses. This calls for greater emphasis on **translational research and transformational action** for scaling CASI in South Asia, which has so far lagged behind other regions (South America, USA, Canada and Australia).
- v. Convincing farmers, which goes beyond filling knowledge gap, would require linking science to society. In pursuance of this, a paradigm shift from routine component based short-term research to **innovative, result-oriented, system-wide long-term research** is warranted. From organization standpoint, forging alliance of innovators, social scientists, public development officials, policy-makers, NGOs and the private sector would ensure faster and desired impact of conservation agriculture for sustainable intensification (CASI). Perceptibly, smallholder farmers adopting CASI are contributing towards ecological services that are inherent to the land biosphere. In recognition furthering the cause of

environmental services, the **resource poor farmers be compensated/ rewarded** suitably. Besides cash dividend, they be provided with tools and tackles facilitating application of CASI technologies, Extending incentive for not burning straw, free custom-hiring of zerotill machinery and cheap credit are the three examples of this genre. Such bold policy decision would inspire farmers ensuring faster scaling of CASI in South Asia.

- vi. **Political commitment and much needed policy support** will be necessary to make CASI an integral part of: (i) country’s development agenda aiming at resilient agriculture, adoption of improved technologies such as: efficient crop, water, nutrient, energy use, etc. and (ii) action plan to fulfil obligations under international treaties and conventions such as: climate change, desertification, Convention on Biological Diversity (CBD), SDGs, etc. Guided by the quality of native biophysical resources and socioeconomic situation of farmers, the policy instrument, hence, would have to be region/country-specific.
- vii. Irrefutably, increased budgetary provision (almost four times), supporting CASI application, is urgently needed for sustaining farm profitability and national food and nutritional security, conserving available natural resources and containing GHG emissions. Primarily, a **national funding** promise such as **“National CASI Mission”** would be the need of the hour to scale CASI practices both in rainfed and irrigated areas. CASI can also be made an

integral part of the on-going public funded schemes of the Governments. Like in India: RKVY-Rashtriya Krishi Vikas Yojna (National Agriculture Development Scheme); in Nepal: Prime Minister's Agricultural Development Program; and in Pakistan, aligning CASI with commitment for Paris Agreement on Climate Change. Yet, complementary international funding would be essential to scale-out innovations around CASI. To catalyze donors and policy-makers, it would be desirable to organize a 'Fundlers' Forum' to ensure scaling of the CASI in South Asia.

viii. Though the positive ecological outcomes of CASI are perceived to be local, these do spill far beyond the boundaries of a nation and even the region. Moreover, what a country does to its natural resources influences greatly environment of its neighbours as well. Although local legal measures are necessary to nip the on-site generation of adverse outputs (like smog from burning of straw), yet to contain the off-site spread, application of CASI principles and practices would essentially require

a “**South Asia Regional Platform** for the Conservation Agriculture for Sustainable Intensification (SARP 4 CASI)” through an effective collaboration and a firm commitment of all national leaders, institutions (NARS), donors and the CG Centres actively engaged in promoting CASI in South Asia.

ix. Such a platform, (SARP 4 CASI) once established on the principles of earlier rice-wheat consortium (RWC), to share knowledge/success stories, technological options/innovations, expertise, etc. would require **effective NARS partnership**. It could be facilitated by one of the CG Centres actively involved in research and development on CASI practices, such as the CIMMYT through its two major regional programs: CSISA (funded by BMGF and USAID) and SRFSI (funded by ACIAR). Involvement also of other CG Centres and institutes like IRRI, ICRISAT, ICARDA, ILRI, ICRAF, BISA, etc. and the National/Regional Fora such as APAARI, SAARC, TAAS, etc. would strengthen further the initiatives on the CASI, so essential for achieving SDGs in the region.





Important TAAS Publications

- National Seminar on “Quality Seed for Food Security through Public-Private Partnership” - Proceedings & Recommendations, April 13-14, 2010.
- National Dialogue on Building Leadership in Agricultural Research Management, Hyderabad - Proceedings & Recommendations, August 27-28, 2010.
- Brainstorming Session on Prospects of Producing 100 million tons of Wheat by 2015 and presentation of Fifth Dr. M.S. Swaminathan Award for leadership in Agriculture - Proceedings & Highlights, December 18, 2010.
- Stakeholder Interface on GM Food Crops - Recommendations, May 19, 2011.
- TAAS Foundation Day Lecture on “Harnessing Knowledge for India’s Agricultural Development” by Dr. Uma Lele, August 12, 2011.
- Farmer’ Led-Innovation - Proceedings and Recommendations, December 23-24, 2011.
- Implementing the International Treaty to Address Current Concerns about Managing our Plant Genetics Resources - Strategy Paper by Dr. R.S. Paroda, January 23, 2012
- The Seventh Foundation Day Lecture on “Ensuring Food and Nutrition Security in Asia: The Role of Agricultural Innovation” by Dr. Shenggen Fan, DG, IFPRI, January 11, 2013.
- Special Lecture delivered at Indian Seed Congress 2013 on “Indian Seed Sector : The Way Forward” by Dr. R.S. Paroda, February 8, 2013.
- Foresight and Future Pathways of Agricultural Research Through Youth - Proceedings & Recommendations, March 1-2, 2013.
- Managing Our Water Resource for Increased Efficiency - Strategy Paper by Dr. R.S. Paroda, May 28, 2013.
- Brainstorming on Achieving Inclusive Growth by Linking Farmers to Markets - Proceedings and Recommendations, June 24, 2013.
- The Indian Oilseed Scenario : Challenges and Opportunities - Strategy Paper by Dr. R.S. Paroda, August 24, 2013.
- National Workshop on Outscaling Farm Innovation - Proceedings and Recommendations, September 3-5, 2013.
- Brainstorming Workshop on Soybean for Household Food and Nutritional Security - Proceedings and Recommendations, March 21-22, 2014.
- The Eight Foundation Day Lecture on “Sustainable Agricultural Development - IFAD’s Experiences” by Dr. Kanayo F. Nwanze, President, IFAD, August 5, 2014.
- Need for Linking Research with Extension for Accelerated Agricultural Growth in Asia - Strategy Paper by Dr. R.S. Paroda, September 25, 2014.
- Global Conference on Women in Agriculture - Proceedings and Recommendations, March 13-15, 2015.
- Brainstorming Workshop on Upscaling Quality Protein Maize for Nutritional Security - Recommendations, May 21-22, 2015.
- National Dialogue on Efficient Management for Improving Soil Health - New Delhi Soil Health Declaration - 2015, September 28-29, 2015.
- Regional Consultation on Agroforestry: The Way Forward - New Delhi Action Plan on Agroforestry 2015, October 8-10, 2015.
- National Dialogue on Innovative Extension Systems for Farmers’ Empowerment and Welfare - Road Map for an Innovative Agricultural Extension System, December 17-19, 2015.
- Round Table Discussion on Promoting Biotech Innovations in Agriculture and Related Issues - Proceedings & Recommendations, August 4, 2016.
- Awareness cum Brainstorming Meeting on Access and Benefit Sharing – Striking the Right Balance – Proceedings, October 22, 2016.
- Delhi Declaration on Agrobiodiversity Management – Outcome of International Agrobiodiversity Congress 2016, November 6-9, 2016.
- Regional Policy Dialogue on Scaling Conservation Agriculture for Sustainable Intensification, Dhaka, Bangladesh, September 8-9, 2017.
- Policy Brief on Scaling Conservation Agriculture in South Asia.
- Retrospect and Prospect of Doubling Maize Production and Farmers’ Income – Strategy Paper by Dr. N.N Singh, September 10, 2017.
- Indian Agriculture for Achieving Sustainable Development Goals - Strategy Paper by Dr. R.S. Paroda, October, 2017



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