Scaling Conservation Agriculture for Sustainable Intensification in South Asia - A Policy Brief

Preamble

Realising 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 organised by the Australian Centre for International Agricultural Research (ACIAR) and the Trust for Advancement of Agricultural Sciences (TAAS) on 8 and 9 September 2017 in Dhaka, Bangladesh. The CIMMYT and the SRFSI project of the Australian supported Sustainable Development Investment Portfolio (SDIP) in SA 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 the SA contributed in drawing conclusions and 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 SA. The primary goal of the dialogue was to review the progress and the state of the CASI in SA and to explore way outs to move forward on scientific, institutional and policy fronts to catalyse 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 on the panel discussion on possibilities of scaling CASI, a Road Map has been suggested for its effective implementation.

The Regional Scenario

The SA 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. The SA is also the most populous (1.87 billion) and densely populated region of the world (330 persons/km^2) (www.Worldmeters.info). Despite these odds, it enjoys a high rate of economic growth. The region still reels under the scourge of extreme poverty (42%) and malnutrition (21%), which are among important agenda of the sustainable development goals (SDGs).

In the SA, there is hardly any scope for horizontal expansion of farm area. Yet the region would need 70 per cent more food by the year 2050 to meet the projected demand. In fact, the future food security in the SA has twin challenges of degrading natural resources and decelerating productivity growth of food grains. The challenges are exacerbated further

owing to sharp rise in 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 per cent. 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 over-exploitation 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 the SA. This drop is a consequence of decline 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 decelerating influence on the crop productivity. Then 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 CO_2 emissions. Additionally, this senseless incineration weakens soil physical, chemical and biological quality attributes.

Influence of the above listed adversaries fuelling unsustainable intensification is maintained because of: (i) existing imperfections in public policy on subsidizing agro-chemicals, power and machinery, (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 is different from sustainable food security; it is optimizing productivity with efficiency and competitiveness. Apparently, sustainable intensification would demand 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 the SA, 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 eco-regional programme, additional funding support was also provided by the USAID, ACIAR and ADB to the RWC. Through adoption of the RWC by 1999-2000, zero-till wheat has been practised 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 the SA; ~75% in India, ~20% in Pakistan and remaining 5% in both Bangladesh and Nepal. Additionally, emphasis on the laser land levelling and raised bed planting strengthened significantly the impact of CA practices. Impressed by the success of the RWC across SA region, as a unique eco-regional programme in the SA, 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 CA. Moreover, there are very few instances of acceptance of full CA 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 CA in rainfed areas (around 60% area in India), it continues to be grossly underutilized in the SA. 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 also have limited knowledge on scientific, economic and environmental benefits of CA. As the result, CA rarely forms part of the packages of practices. Moreover, CA demands farmers' participatory research approach, which remains totally neglected. Resultantly, CA 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 CA practices. It was also as the CA research in the past was mainly focused on rice-wheat irrigated system. The present need is for diffusion and adoption of CA in irrigated upland

and rainfed ecologies. Above all, CA is more than a cost- cutting technological option, as it leads to sustainable development, while providing environmental services as national public good. Notwithstanding, CA spread continuing to be rather slow, obviously requires a major policy thrust and that too in a Mission Mode.

Road Map for Scaling CASI

i. Conceptually, CA is not a single technology. It is an innovation for sustainable farming, assimilating effective germplasm/crops, integrated nutrient/pest management, minimal 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 nation. Hence, CA being a national/regional/international public good, it needs to be out-scaled to reap multidimensional benefits.

ii. Farmers in the SA are predominantly small and marginal with a limited risk taking ability. Hence, out-scaling of CA principles has to adopt **farmers' participatory approach**, requiring on-farm research, validation, refinement and faster adoption methodology.

iii. Noticeably, the complexity of scaling CA 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' programme/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 CA principles and practices without any dissemination losses. This calls for greater emphasis on **translational research and transformational action** for scaling CA in the SA, 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 the CA for sustainable intensification (CASI).

vi. Perceptibly, smallholder farmers adopting CA are contributing towards ecological services necessary to combat adverse impact of climate change. In appreciation of their contribution towards environmental safety, the **resource poor farmers must be compensated/rewarded** monetarily. Such bold policy decision would ensure faster scaling of CA in the SA.

vii. **Political commitment and much needed policy support** will be necessary to make CA an integral part of: (i) country's development agenda aiming at resilient agriculture, land reforms 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, CBD, SDGs etc. Guided by the quality of native biophysical resources and socio-economic situation of farmers, hence, the policy instrument would have to be region/country-specific.

viii. Irrefutably, increased budgetary provision (almost four times), supporting CA 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 CA Mission" would be the need of the hour to scale CA practices both in rainfed and irrigated areas. CA 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 CA with commitment for Paris Agreement on Climate Change. Yet, complementary international funding would be essential to scale-out innovations around CA. To catalyse donors and policy- makers, it would be desirable to organise a 'Funders' Forum' to ensure scaling of the CASI in the SA.

ix. Though the positive ecological outcomes of CA 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 on-site generation of adverse outputs (like smog from burning of straw), yet to contain 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 CA in the SA.

x. Such a platform, 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 would be facilitated by one of the CG Centre actively involved in research and development on CA practices, such as the CIMMYT through its two major regional programmes: 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.