



## **Research Priorities to Promote Sustainable Agricultural Intensification in Indonesia**

Tahlim Sudaryanto

Senior Agricultural Economist, Indonesian Center for Agriculture Socio Economic and Policy Studies, Ministry of Agriculture, email: [tahlim@indo.net.id](mailto:tahlim@indo.net.id)

### **Background**

Indonesia's strong and consistent economic growth has contributed to steady progress on poverty reduction and improved food security. In the agriculture sector, Indonesia is the largest producer and exporter of palm oil, the second largest producer of natural rubber, the second largest exporter of cocoa, and the third largest producer of rice. However, some recent studies show that agricultural productivity growth is at risk. Among the issues identified include: the excessive use of chemicals, pollution and soil fertility problems, conversion of forest land linked to soil erosion, carbon and nutrient losses, and declining water quality.

On the other hand, the country faces pressing challenges to meet food security needs of the growing population, to fight against poverty, to create employment opportunities and decent income.

In response to these issues, an appropriate strategy is to pursue "sustainable agricultural intensification". The major driver to achieve that strategy is agricultural innovation driven by research and development. The purpose of this brief is to review research priorities supporting a sustainable agricultural intensification.

### **Sustainable agricultural initiatives and research priorities**

Structural transformation within agriculture is occurring but the agrarian structure is largely unchanged. Smallholder agriculture with limited mechanization predominates. About 70% of the poor lived in the rural area and they are increasingly relying on off-farm sources of income. The gap between agricultural and non-agricultural incomes is widening.

Agricultural growth has featured a heavy environmental footprint such as frequent conflicts between agricultural support and environmental protection policies and programs, agriculture and aquaculture expansion has been a major contributor to deforestation and biodiversity loss, heavy fertilizer and pesticide use is also a major contributor to water pollution. The agriculture sector remains a major contributor to Green House Gas (GHG) emissions, and is showing an upward trend.

Sustainable agricultural intensification is "a process or system where agricultural yields are increased without adverse environmental impact and without the cultivation of more

land". Challenges of sustainability in agriculture are: (i) whether agriculture is able to meet future global food demands without adversely affecting the resource base; (ii) what is an appropriate approach to enable agriculture to provide sufficient food and play a role as a driver of pro-poor growth under resource constraints?

Current production practices related to sustainable agriculture include: (i) Indonesian Carbon Efficient Farming (ICEF); (ii) integrated crop-livestock production; (iii) multiple cropping; and (iv) waste management.

### **Irrigated lowland agriculture**

There are 10 principles for sustainable lowland agriculture: (i) increase productivity; (ii) soil and water conservation; (iii) zero waste; (iv) protection of indigenous biodiversity; (v) utilization local natural resources; (vi) integrated pest management; (vii) adaption to climate change; (viii) integration crop and livestock; (ix) low heavy metal pollutant; and (x) low greenhouse gases emission.

Proposed new technology application: (a) ecological engineering to restore and conserve biodiversity; (b) best nutrient management practices; (c) a computer-based decision tool for extension specialist and farmers; (d) site specific fertilizer application; (e) agro-advisory services for rice farms; (e) coping with climate change: submergence tolerance and salinity tolerance; and (f) closing rice yield gaps.

Priority research agendas: (i) productivity improvement: land management, efficient fertilization, variety improvement, plant rotation; (ii) soil and water conservation: water management, soil organic matter conservation; (iii) integration of crop and livestock or fish culture: integrated food crop and livestock, integrated sugar cane and livestock, integrated oil palm and livestock, crop and fish culture; (iv) adaption to climate change: integrated cropping calendar, standing crop, accurate climate prediction and (v) policy research: supporting sustainable agriculture through integrated landscape management.

### **Upland agriculture**

Development of dry land agriculture has: (a) follow the regional approach (include socio-cultural); (b) reform in the planning of dryland development program in the form of an integrated program, featured thematic (multi commodities); (c) coordinate the development of the multi-sectored area because dry land is a needs coordination in its development; (d) improve infrastructure development so that no imbalance with infra development structure in paddy fields.

Priority research agendas: (a) improvement of soil fertility, consisting of technology calcification in dry land sour and technological rock phosphate; (b) utilization of biological resources consisting of: technology on mycorrhiza-seraan better nutrient with the hypha extension roots, technological improvement legume- RHIZOBIUM- N fixation in soybean nodules, technology decomposer-composting of organic materials, soil-borne disease prevention technologies; (c) management of land, consisting of: land conservation (alley cropping, grass strips, agroforestry, etc., and water conservation and irrigation supplements; (d) selection of plant varieties, composed of the choice of plants that are tolerant to acidity and dryness; (e) assessment test on the water and land management.

## **CONCLUSION**

Implementation of sustainable agricultural intensification requires adjustment on the policy framework which strikes a balance between achieving food self sufficiency and diversification toward high value commodities to increase farmers' income and promote economic growth. Government supports the development of food crops and high value commodities and they should be appropriately balanced. These include investments on infrastructures, research and development, market development, and pricing policies.

Developing sustainable agricultural intensification should be implemented in paralel with building resilience of food and agricultural system. This includes elements of productivity improvement, risk management, agricultural insurance, social safety net, capacity development, and strengthening social capital at both household and community levels.

Incentive policies to encourage rehabilitation of degraded land by smallholder farmers include: (a) secure land tenure; (b) infrastructure development; (c) subsidies for initial investments; and (d) subsidies for high quality planting materials.

Understanding the concept of sustainable agricultural intensification should be mainstreamed among policy makers, academia, and the general public. Furthermore, the approach needs to be incorporated into any agricultural development program.

### **REFERENCES]**

Indonesian Agency for Agricultural Research and Development (IAARD). 2015. "Sustainable Agricultural Intensification in Indonesia: A Policy Roundtable on Research Priorities, Summary and Recommendation, Bogor, 29-30 April 2015.

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