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Opportunities and Challenges Facing Farmers in Transitioning to a Green Economy Agriculture Practice

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Introduction

Understanding the needs and critical role of farmers in advancing sustainable development requires recognizing the commonly shared and the distinctively different conditions and capabilities that exist in the developing and developed world countries. Today's agricultural production paradigms span a variety of practices ranging between the developed world's **'high input-higher yielding'** farming methods that significantly rely on the use of fossil hydrocarbon inputs; and those of the developing world's **'low input-lower yielding'** farming methods that use little if any fossil fuel based resources but generally produce low yields and reduce soil fertility. In choosing public and private initiatives to encourage and enable farmers to transition to **'sustainable input-higher yielding'** agriculture practices; we must recognize that there is no single strategy that could deliver the magnitude of transformation needed to achieve widespread adoption of the broad array of Green Agriculture practices.

As used in this paper, **'Green Agriculture'** refers to a variety of integrated farming practices that emphasize the use of naturally and sustainably produced soil nutrients and cultivation of diversified crops and livestock husbandry in a manner that enhances overall farm productivity in balance with local, regional and global environmental resources. These practices improve water use efficiencies and control soil erosion by promoting minimal disturbance of the topsoil and maintenance of adequate ground covers of organic carbon matter. In the aggregate, green farming practices demonstrate increased agricultural productivity of currently farmed lands; reduced vulnerability to price volatility of fossil hydrocarbon resources and improved agricultural resilience and adaptability to changing climate conditions. Green agriculture also encompasses a range of social equity benefits that improve farmer livelihoods while producing and preserving beneficial ecological services.

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A primary goal of green agriculture systems is to enable farmers to increase their efficient use of inputs to realize higher produce yields in order to meet growing consumer demand for nutritious food. Of equal importance are goals to improve the social equity and prosperity of farmers and their communities and to restore and maintain a healthy environment. Truly sustainable agriculture stewardship must not only improve current farmer livelihoods and their productive use of natural capital resources and ecosystem processes; it must do so in ways that do not compromise the health and prosperity of future generations that will follow.

This policy paper has been prepared to highlight the key opportunities and challenges confronting farmers throughout the world as they consider and adopt practices that contribute to green economic development, poverty eradication and improved food security. It focuses on the role of farmers in green economic development and how a transition to a green economy could benefit farmers. It also describes the primary means to accomplish sustainable farming and discusses key policies and public/private investments that would advance a 'green agriculture' transition. It is intended to catalyze multi-stakeholder dialogues that place farmers at the center of international efforts to assess costs and benefits and to build a consensus for action at local, national, regional and global scales.

This policy brief presents a set of best practice recommendations intended to stimulate discussion by farmers, their representative organizations, governmental and private sector leaders and other stakeholders involved in the agricultural production sector. This paper could also help inform and guide deliberations and planning efforts now underway to advance International Environmental Governance (IEG) and to establish a more effective Institutional Framework for Sustainable Development (IFSD). This paper may also serve as a high level summary that articulates farmers' issues and perspectives in order to encourage their consideration in the comprehensive multilateral discussions to be undertaken during important institutional, public and private sector deliberative and decision making processes and forums, including the Rio + 20 Summit.

Key Messages to Principal Stakeholders

Farmers

There are many challenges facing today's farmers. The nature and scale of these challenges vary according to whether they farm large tracts of land with mechanized cultivation of high yield monoculture crops boosted by petrochemical fertilizer, pesticides and herbicide inputs or farm small land areas with hand tools and without the use of any petrochemical inputs that results in degraded soil fertility; or if they practice a variety of farming methods between these extremes. They all share vulnerability to the vagaries of weather; to encroaching climate change; to increasing costs of fossil fuel based inputs to changing consumer demands and to the rising market power of agricultural input suppliers and

Key messages to smallholder farmers:

- Strive for improved and gender equitable legal rights to ownership and tenure for the lands that you farm
- Develop and share knowledge and information on sustainable agroecological farming methods
- Establish and strengthen farmer associations that amplify your voice and commercial power
- Leverage farmer association capabilities to improve access to capital and to supply value added markets
- Invest in post harvest storage and warehouse infrastructures to improve market access options
- Support local and regional commercial production of organic agricultural inputs
- Augment integrated agroecological practices with micro-dosing of synthetic inputs for higher yields
- Partner with neighboring farmers to improve local watershed management and land stewardship
- Demand participation in public policy development decision making and in public/private partnerships
- Participate in community seed banks that stock and share high quality indigenous crop variety seeds



the buyers of their products. Farmers also confront a continued and accelerating rural-to-urban migration of young adults in search of jobs and improved livelihoods. The social impacts of this worldwide trend include an impaired availability and capability of rural labor; diminished viability of non-farm rural enterprise and qualitatively lower levels of civil society benefits in rural areas.

However, these commonly shared challenges are further delineated by the specific conditions of local geographies and agri-climates; economic and health constraints of individual farmers and many other factors. These distinctly different challenges are shaped by each farmer's specific situation regarding land tenure and ownership; access to capital and degree of indebtedness; availability of agricultural technical support; gender inequities; and other conditions. Only when all of the above noted challenges are addressed can we begin to formulate strategies that encourage a transition to sustainable agricultural practices that are tailored to the needs of smallholders and large industrialized farmers who in the aggregate represent the global agriculture sector.

Public Policy Makers

Policy makers from all levels of government, including local, state, regional and national executive, regulatory and legislative leaders and representatives of international institutions all have significant roles in determining how the public sector could encourage private sector investments in sustainable agriculture production systems. Foremost is the need to recognize and value the multi-functionality of agriculture which provides economic products, social livelihoods and environmental benefits. With this perspective, policy makers need to identify, reform and eliminate public policies that promote unsustainable agricultural practices. Farmers' excessive reliance on non-renewable resources is a key contributor to climate change and is promoted by public subsidies of market prices for unsustainable inputs (e.g. lower costs for synthetic fertilizer or electric power used for irrigation pumping). These perverse subsidies reduce the competitiveness of more efficient and sustainable farming inputs and methods.

There are also hidden subsidies in the form of inadequate regulation of practices that pollute the environment and emit GHG's. The inefficient use of agrochemical inputs results in significant runoff of these chemicals from fields into freshwater supplies. Similarly, livestock wastes from large feedlots also impair water quality. These chemical and organic pollutants

Key messages to large scale industrial farmers:

- Invest in precision application technologies that improve your efficient use of inputs
- Adopt increased crop diversification and more extensive integrated crop rotation cycles
- Implement reduced tillage and No-Till cultivation techniques to improve soil conditions
- Invest in more efficient water irrigation technology
- Participate in land conservation set asides to reduce soil erosion and water loss and improve local biodiversity
- Advocate public support subsidies for green agriculture transitions that would replace commodity crop production subsidies
- Participate in sustainable agriculture certification and product labeling market formation initiatives

Key messages to policy makers:

- Support agrarian land rights reforms that enable smallholder farmer ownership of their farms
- Reduce and eliminate direct and indirect subsidies for unsustainable farming practices and inputs
- Establish public financial support for farmers' initial green agriculture transition efforts and investments
- Increase public funding of agroecological sciences, research and development and higher education
- Support green agriculture extension services, field trials and wireless information services for farmers
- Increase public investment in agriculture, especially if farming is a major contributor to GDP and jobs
- Implement oversight of large agribusinesses' market dominance to ensure a competitive private sector
- Promote innovative transborder policy mechanisms that enable watershed area governance
- Implement public procurement preference policies for local, sustainably produced food
- Integrate national health and environment goals with sustainable agriculture and food security
- Invest in rural and urban sanitation infrastructures that recover wastes for organic nutrient inputs
- Initiate citizen/consumer awareness and education efforts to inform the public of sustainability benefits
- Reform trade policies to support phyto-sanitary standards and smallholder farmers participation in value added domestic and export markets
- Promote bioenergy policy priorities for sustainable biofuels to modernize domestic agriculture sector



have detrimental consequences for aquatic species (e.g. eutrophication of wetlands and coastal area fisheries) and human health. These negative externalities of environmental degradation are generally not factored into the costs of conventional agriculture production; resulting in farmers being incited by market forces to ignore such consequences. Initiatives to monitor and measure such externality costs and include them in market prices for unsustainably produced agricultural products would dramatically advance the economic viability of a wide range of green agriculture innovations. In addition, preferential consideration of sustainably produced food should be included in international trade policy reforms that encourage food safety standards and increased participation of smallholders in domestic and export markets.

Another critical area of public policy is the role of government in educating its citizens about the multiple benefits of sustainable agriculture; with particular attention to the personal and public health implications of nutritious food consumption and more sustainable dietary behaviors. Building improved consumer awareness of the value of more nutritious and sustainably produced food and other agricultural products will be a critical counter balance to consumer market pressures for less expensive food and for diets with higher proportions of resource intensive meat and dairy products.

Private Sector Business Leaders

It is clear that the needed scale and pace of a global transition to green agriculture practices can only be achieved with the full commitment and resources of the private sector. Green agriculture’s potential for sustainable productivity and environmental gains should make it an important issue for businesses. However, from a market economy perspective, quickly generating high economic returns on many green agriculture investments may be challenging. It may be particularly difficult to achieve quick returns in many industrialized farming operations that require multi-year transition efforts. The gradual rebuilding of natural capital assets may be difficult for private sector managers who are responsible to shareholders and financial institutions who seek maximized near term profits. Furthermore, expectations for year-to-year profit growth have the effect of highly discounting the future value of productive gains that would be realized with green agriculture investments that are made today.

Given these challenges, it will require innovative business leaders with a strategic view of both the near and long term to embrace sustainable business plans based upon green agriculture principles. Private sector initiatives should create supply chain models that promote collaboration among key suppliers, farmers and their wholesale customers. Within the agriculture and food system sectors, such partnerships are needed between food processors, leading brands, major consumer market retail outlets and their ‘upstream’ suppliers of agricultural products (e.g. farmers, wholesale aggregators and exporters). Encouragement of sustainable farming practices should be a core element of comprehensive risk management strategies that benefit all parties. Agroecological practices would help farmers

Key messages to private sector:

- Build supply chain partnerships with farmers that support sustainable agriculture practices
- Support capacity building of farmers and their communities to participate in value added functions
- Reduce your products’ ecological footprint with more efficient processes, packaging and local suppliers
- Invest in consumer information and product certification processes to increase demand for sustainable products
- Cooperate in forming industry alliances to promote harmonious sustainability certification standards and compliance protocols
- Invest in sustainable agriculture input suppliers and promote formation of rural supply chain networks
- Scale up sustainable supply chain pilot projects to become core operations practice of the firm



provide high quality products at reasonable costs regardless of uncertain future fossil hydrocarbon prices or availability; and would enable farmers to better adapt to climate change stresses.

Retail businesses are responsive to changing markets for agricultural products. These firms spend significant resources to brand and promote their products in order to influence consumer purchasing decisions. Global population growth, increasing per capita incomes and continued urbanization are resulting in consumer demands for more and higher quality agricultural products (e.g. more meat and dairy, more processed foods). Consumers also seek lower prices. Sustainably meeting all of these demands will be challenging. The private sector has an opportunity to inform consumers of the benefits of sustainably produced food by certifying and branding such products in the retail marketplace. Such eco-labeling initiatives are critically needed to build consumer demand and a willingness to pay for green agriculture's multiple benefits.

Non-Governmental Organizations (NGO's)

Non-Governmental Organizations (NGO's) can be highly effective catalysts for transforming current unsustainable farming practices into more sustainable, environmentally balanced and socially equitable agriculture production systems. The NGO community spans a broad spectrum of issues and agendas for changing society with many organizations focusing on improving conditions facing the poor in the developing world. Some NGO's are large, heavily endowed philanthropies or international organizations with operations throughout the world; while others may be relatively small groups that have coalesced to focus on actions that address a specific local or national issue. The breadth of diversity across the 'NGO sector' is extensive; which makes it difficult to make high level recommendations regarding what NGO's should do to advance sustainable farming.

When considering their strengths and opportunities to undertake initiatives, foremost is the relative degree of independence most NGO's have with regards to prevailing public or private sector interests. Although practically every NGO requires financial support from a variety of donors, governmental agencies or other supporters; most NGO's have a fairly wide degree of latitude with respect to the issues they choose to address and the engagement tactics they adopt. Some may undertake more confrontational public policy advocacy campaigns that provide information and focus citizen interest and support for a particular issue targeted by the NGO. Others may choose to support innovative field projects that put into practice sustainable farming methods that deliver tangible, positive impacts to the participating families and communities. Still others may have the resources to sponsor major research and development programs that generally are only possible with the support of governmental appropriations or private corporate investments.

Most NGO's have the ability to quickly focus on an issue and decide a course of action. This organizational nimbleness gives the NGO community an ability to work

Key messages to NGOs:

- Increase and expand coalition building efforts across the global NGO community for green agriculture
- Enable increased public access to sustainable farming technical information and field performance data
- Extend outreach efforts to engage more farmer organizations and agribusinesses to form partnerships
- Increase public awareness of the health and ecological impacts of diets that emphasise consumption of meat, dairy and highly processed foods
- Increase citizen and consumer pressure on public and private sector to adopt green agriculture plans
- Promote and sponsor scientific research and social capacity building to support agroecological farming
- Integrate green agriculture initiatives with poverty alleviation and MDG efforts



with other groups that have similar concerns and goals and facilitates the rapid formation of alliances and collaborations to address a set of common objectives. With the broadening reach of internet telecommunications and information sharing technologies; geographically dispersed NGO's have the capability to work with each other in ways that can be highly effective in impacting local, national and global initiatives for positive change. Furthermore, NGO's have a distinct advantage in serving as a brokering agent between farmers, public agencies and private industry to create 'public/private partnerships' that can undertake innovative initiatives and demonstration trials to test and advance best practices in sustainable agriculture. Such initiatives are urgently needed to generate the proof of concept evidence that is often required to justify much larger public and private sector decisions to invest in a global transition to green agriculture.

Patterns of Agricultural Production Systems

There are a wide range of agricultural production methods currently in use throughout the world. These practices span a variety of techniques that rely on differing levels of land, water, labor, energy, capital and other inputs and are significantly defined by local climatic and agroecological conditions. The difference between current production paradigms may be concisely viewed as a spectrum of choices reflecting varying degrees of dependence on the use of industrialized, highly mechanized, high input farming techniques and smallholder farming operations that are characterized by a higher reliance on manual labor, draught animal power and the relatively low use of farm mechanization and fossil fuels, synthetic fertilizers and other agrochemical inputs. For this policy brief, discussion will primarily focus on the extremes of production patterns as evidenced in U.S. agriculture production systems and those of subsistence smallholder farmers in Least Developed Countries (LDC's).

U.S. farming sector as representative of Developed World conditions

U.S. agriculture is highly productive, having demonstrated over the past sixty years continuously increasing output yields on the basis of both land area and labor inputs. Similar high levels of production performance have also been achieved in Europe and other OECD countries. When considering the perspectives of U.S. farmers, it is important to note that there are nearly 2.2 million farms operating in the U.S.; with an average size of 419 acres per farm (i.e. 168 hectares). The average age of an American farmer is 57 years old and average capital investment per farm (i.e. machinery, tractors, etc. but excluding livestock or land and building values) is approximately \$88,000 (USDA-NAS. US Census of Agriculture 2007). Recent increases in global food prices; the limited availability of unused land that could be cultivated and high capital costs of mechanized equipment are driving the increase of farm land values. These changes have made it challenging for younger generations to afford farm land and contribute to agricultural production.

U.S. agricultural output is predominantly produced on large scale farming operations. Although large scale family farms with annual sales greater than \$250,000 and non-family (e.g. corporate owned) farms represent only 12% of total U.S. farms; these large farms (i.e. with an average of nearly 2000 acres per farm) produced 84% of the total value of U.S. farm production (USDA-ERS. 2010a). This increasing level of concentration of U.S. agricultural output from large acreage farms is even more evident in livestock operations. Although only 2.7% of all dairy farms have more than 1000 head of milk cows; these large operations represent 44% of the national



cow inventory and produce 48% of all milk. An even more extreme concentration of production is found in the hog and pig subsector; where only 0.5% of all operations have more than 20,000 head of livestock, yet control nearly two-thirds of the total national swine inventory (USDA-NAS, 2011).

This trend of increased specialization and concentration of crop and livestock production has resulted in nearly 60% of all cultivated acreage planted with four crops (i.e. corn, wheat, soy and cotton). The dominance of monoculture commodity crops is partially due to increased market demands for globally traded commodities, livestock feed and 1st generation biofuel feedstocks and is also encouraged by current production subsidies from the U.S. government. The rapid rise of Concentrated Animal Feeding Operations (CAFO's) reflects growing domestic and international demand for meat products and the continued specialization of the various stages of animal husbandry. The significant production levels for these monoculture commodity crops have been enabled in part by relatively high application rates of fertilizers (e.g. U.S. corn production uses an average Nitrogen input of more than 143 lbs. per acre in 2010)(USDA-ERS. 2010b). However, fertilizer use has stabilized over the past 10 years due to the greater use of improved hybrid plant varieties; precise application of inputs and other innovative technologies.

The high use of synthetic inputs in the U.S. has created significant environmental impacts; particularly with respect to the leaching of nitrates, herbicides and pesticides into fresh water and marine ecosystems. Agrochemical runoff has resulted in increased eutrophication in downstream watersheds and estuaries and has prompted federal and state governmental regulation and oversight of pollution sources from the agriculture sector. High intensity input farming and the increase of ruminant livestock and related concentrated animal feeding operations are significant sources of nitrous oxide and methane GHG's and also contribute to nutrient loading of fresh water supplies that can result in hypoxic conditions that are lethal to many aquatic species. Furthermore, there are signs that Herbicide Resistant (HR) weeds are appearing on many farms that rely on the use of herbicides (e.g. glyphosates) and genetically modified herbicide tolerant crops to control weeds and increase crop yields.

In contrast to the environmental impacts of conventional farming practices; there are promising trends in which certified organic agriculture production acreage in the U.S. has increased by 51% between 2005 and 2008. U.S. organic produce and beverage revenues grew at an annual rate of nearly 8% in 2010; far outpacing overall market growth of less than 1% (Greene, *et al.* 2010). The rapid growth of market demand for organic food and other products has been stimulated by growing consumer awareness of improved food safety and quality of organic produce; and that organic farming practices have more benign ecosystem impacts. However, even with its recent growth, the current magnitude of organic farming gains should be qualified with the recognition that organic foods currently represent only 4% of the total U.S. food and beverage market (OTA, 2011).

The wide range of income and production output levels across all U.S. farms indicates that even within this affluent and industrialized nation, there is a significant divergence of views on what are the most appropriate and effective actions needed to transform current practices into a more sustainable green economy agricultural sector. This divergence suggests that different strategies will be needed in order to motivate and enable large industrialized farms and small to medium sized family farms to undertake the adoption of green agricultural practices.



Furthermore, it should also be noted that substantial productivity gains are also being achieved by high intensity input farming operations in Brazil, China, India and other rapidly developing nations. However, these gains are accompanied by increasing concern about long term sustainability given their reliance on non-renewable resource inputs; increased irrigation that often exceed hydrologic recharge rates and continued deforestation pressures .

Smallholder farming as representative of Developing World conditions

There have been significant improvements in total agricultural productivity gains in many Developing World nations over the past fifty years. However, in most cases the smallholder farmers in these nations produce the majority of food domestically consumed. Despite rising agricultural production in most countries, continued threat of food insecurity, significant incidence of malnourishment and hunger among the poor and rapidly growing populations are factors that should make smallholder farmers the primary focus of any efforts to improve sustainable farm production. Approximately 85% of all smallholder farms in the developing world have land areas of less than 2 hectares (Byerlee, et al. 2007) and more than one half of smallholder farms are operated by women. In some countries such as in Sub-Saharan Africa, women lead nearly three-quarters of all farming households. These predominantly rain fed farms are characterized by very low or no use of synthetic fertilizers or other inputs and a reliance on manual labor for cultivation and harvesting. Many of these farms produce subsistence levels of food for the family with little surplus available to sell in local markets for income.

These smallholder farm operations are more susceptible to topsoil erosion due to the continued depletion of soil nutrients; poor soil structure and the limited retention of crop residues or ground cover on their fields. Furthermore, their crop yields are significantly less than the production levels achieved by farms in the same region that are irrigated and applying adequate inputs or that are implementing more integrated agroecological cultivation practices. In addition, most smallholder farmers lack adequate post harvest storage and handling capabilities that result in substantial levels of spoilage and loss of harvested produce. Poverty levels are high and many smallholder farmers, particularly women have limited or no assurance of land tenure. These economic vulnerabilities result in most farmers having severely limited access to working capital that is needed to improve their operations and increase crop and livestock yields.

In many developing countries, the severely limited transportation infrastructure in rural areas significantly impacts the availability and cost of agrochemical inputs and higher quality seed. Such infrastructure inadequacies also impair the development of sustainable agricultural input production and distribution supply chains and

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