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Promoting Sustainable Agriculture: Experiences from India and Canada

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Abstract

Agriculture sector, world over, has experienced a phenomenal growth since the mid-twentieth century. The growth, driven by Green Revolution technology, has made a significant dent on aggregate supply of food grains, ensuring food security to the growing population. The next stage of agricultural growth however, faces a serious challenge in terms of sustainability. Whereas the main problem faced by the developing countries in the south pertains to sustainability of resource use, the main challenge facing the developed economies in the north is overuse of chemical inputs. These problems have led to increasing awareness and a felt need for moving away from the input intensive agriculture perused during the Green revolution phase, to sustainable farming in different parts of the world. While the need for a paradigmatic shift in the growth strategy is well recognized, the transition from input intensive to sustainable farming however, has certain inherent difficulties. Notwithstanding these limitations, policies in both the north as well as the south have led increased emphasis on promoting sustainable agriculture. Organic farming is a variant, receiving special thrust under these policies. The promotional policies however would vary across these countries, given the basic differences in the initial resource conditions as well as the critical policy goals in the two sets of countries. Given the differential context as well as policy imperatives, it would be useful to examine the policy approach as well as actual experience for promoting sustainable agriculture in the north and south.

The proposed paper is an attempt to examine the policy initiatives as well as experience of promoting organic farming in India and Canada where the need for promoting sustainable agriculture has been recognized in the policy statements. In fact, the policy initiatives if any, have emanated mainly form the viewpoint of trade concerns. In the face of these challenges organic farming is nonetheless making inroads in both India and Canada. Unfortunately, there are very few studies that have gone into examining the issues of economic viability, institutional support, and market access for organic farming in India and Canada. This paper tries to fill-up this critical gap by examining these issues in a comparative framework. The analysis, mainly exploratory in nature, is based on the existing literature and secondary data.

JEL Classification : ***O13, Q21***

Keywords : ***Sustainable Agriculture; Organic Farming; India; Canada***

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List of Abbreviations

AAFC: Agriculture and Agri-Food Canada

CICR: Central Institute for Cotton Research

FAE: Fisheries, Aquaculture and Environment Department, Prince Edward Island

FAO: Food and Agriculture Organization of the United Nations

GoI: Government of India

IFOAM: International Federation of Organic Agricultural Movements

NAP: National Agricultural Policy

NGO: Non-Governmental Organisation

NPK: Nitrogen, Phosphate and Potassium based fertilizers

NRSA: National Remote Sensing Agency

OECD: Organisation for Economic Co-operation and Development

WWF: World Wildlife Fund

WWFC: World Wildlife Fund Canada

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1. Introduction

Globally, the agriculture sector has experienced phenomenal growth since the mid-twentieth century. The growth, driven by Green Revolution technology[1], has significantly augmented the aggregate supply of foodgrains, ensuring food security to the growing population both in the south as well as the north. The next stage of agricultural growth however, faces a serious challenge in terms of sustainability. Problems of resource use and intensification of chemical inputs have led to increasing awareness and a felt need in different parts of the world for moving away from the input intensive agriculture promoted during the green revolution to sustainable agriculture[2]. While the need for a paradigmatic shift in the growth strategy is well recognized, the transition from input intensive to sustainable farming, however, has to address certain inherent issues such as (a) effects on productivity; (b) increased requirement for labour, skill and other inputs; and (c) effects on cost and return and hence on farm produce prices.

While these issues have received inadequate attention, policies in both the north as well as the south have led increased emphasis on promoting sustainable agriculture. Organic farming is a variant, receiving special emphasis under these policies. The promotional policies and goals however vary across countries, given the basic differences in resources, natural and human. A shift towards sustainable agriculture may reduce overall production in the short and/or medium

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1 Green Revolution technology includes chemical fertilizers and pesticides along with high yielding seed varieties and other modern cultivation practices; these were heavily promoted during the 1960s and 1970s.

2 Sustainable agriculture refers to agricultural systems that maintain long-term economic, social and environmental viability. As such, the agricultural sustainability encompasses more than the agro-ecosystem's ability to maintain productivity and also includes economic valuations, legal and social framework as well as environmental accounting and monitoring.

to long term. As such, this agricultural contraction may cause food security problems in developing countries of the south and reduced agricultural income and exports in developed countries of the north (Shah, 2005).

An examination of the different policy imperatives and actual experiences in promoting sustainable agriculture in the countries of the north and south finds relevance not only in the light of global environmental concerns but also the increasing liberalization of agricultural trade. A comprehensive examination of all countries' policies in the limited space of this paper would be difficult. As such, the paper examines policy initiatives as well as the experiences in promoting sustainable agriculture, particularly organic farming, in representative countries of the south and north, India and Canada, respectively. Both these countries have recognized the need for promoting sustainable agriculture in their policy statements. Although the policies differ, both countries are developing organic farming as an approach for sustainable agriculture taking into consideration both environmental concerns and the growing global organic produce market. However, various obstacles do visage the adoption of organic farming in each country. For instance, in India the basic constraints are related to cost of conversion, potential yield reduction and institutional support. In India the organic-conversion consequences could have serious repercussions for food security, livelihoods of marginal and small farmers as well as labour. The major constraints are similar in Canada. However, the consequences, though still serious for farmer livelihoods, are less grave given the Canadian agro-economic context. Meeting the challenges posed in adopting organic farming involves a change in the pattern of public investment and institutional arrangement. There are very few studies that have gone into examining the issues of economic viability, institutional support, and market access for organic farming in India and Canada specifically. This paper examines these issues in a comparative framework.

1.1. Objectives

The specific objectives of the study are twofold:

(i) To examine reasons for and status of sustainable farming practices, in the light of resource base as well as production scenarios, in India and Canada;
(ii) To review policy initiatives for promoting sustainable agriculture with a specific focus on organic farming, and identify future challenges.

The paper is based on existing literature and secondary data. The paper is divided into six sections. The next section gives a brief overview of sustainable agriculture focusing on organic farming. Section 3 presents a brief profile of resource base and agricultural production scenario in India and Canada representing south and north, respectively. This is followed in sections 4 and 5 by discussion of policy initiatives and challenges for promoting organic farming in these countries. The last section highlights important observations and identifies need for further research.

2. Environmental Concerns and Emergence of Sustainable Agriculture in the North and South

The concerns for shifting towards sustainable agriculture in general and organic farming in particular have emanated mainly from the developed countries in the north. During the post-World War II period, agriculture in the north dramatically intensified, in terms of external inputs such as chemical fertilisers and pesticides. Agricultural intensification has had many negative environmental externalities associated with it – for instance, soil erosion, degradation of soil quality, water and air pollution. Although this intensification was initiated in the north, many of the practices and their associated negative impacts have spread to the south. In order to tackle these problems, environmentally beneficial sustainable agricultural systems have been widely promoted. Sustainable agriculture refers to a wide range of practices; most frequently, these practices focus on soil and moisture conservation, and reduced or no use of chemical inputs.

Among the various approaches to sustainable agriculture, organic farming, which incorporates a holistic set of environmentally beneficial practices including the omission of synthetic chemicals, has received considerable attention. In fact, consumers are increasingly demanding 'environmentally-friendly' and healthy food. This preference is being expressed to some extent by an increased demand for organic foods. Such consumer preferences have been well reflected in developed countries. Since the early 1990s, the market for organic produce in the Europeon Union (EU), North America, Japan and other developed countries has grown at rates ranging between 10 and 25 percent (Willer and Yusefi 2004).

2.1 Organic Farming

The organic agriculture movement began in Europe during the early 20th century with Rudolf Steiner in Austria, Lady Eve Balfour and Albert Howard in England and moved to the United States and Japan under the leadership of J. I. Rodale and Masanobu Fukuoka, respectively. Keeping the main objective of sustainability in agriculture as the maintenance and improvement of the agro-environment, organic farming has been defined in several ways. There are two general classes of organic farming definitions: the first, ideological/philosophical; the second, market-driven institutional.

The ideological and philosophical stance of many of organic farming's early proponents gave rise to a general set of organic principles. Although organic farming is often thought to be simply synonymous with the prohibition of all synthetic fertilizers and pesticides, the term 'organic' is used to refer not to the type of inputs used per se but to the concept of the farm as an organism, in which all the component parts – the soil, minerals, organic matter, microorganisms, insects, plants, animals and humans – interact to create a coherent whole.

Institutional definitions of organic farming have evolved out of the former in response to the market's need for standardized organic production practices. Owing to market requirements, organic farming, unlike other variants of sustainable agriculture, has emerged as a system with clearly identified legislated as well as voluntary standards and certification procedures. This standardisation has become increasingly important for access to organic markets, domestically and internationally.

The benchmark organic standard is that set by the Codex Alimentarius of the Food and Agriculture Organisation (FAO), which closely follows that of the International Federation of Organic Agricultural Movements (IFOAM) (FAO 2001; IFOAM 2002). IFOAM has been listed by the ISO (International Organisation for Standardisation) as an international standard setting body; thus making IFOAM's standards serve as an international reference.

The guidelines set down by the Codex Alimentarius commission, considered to be the highest international body on food standards, cover principles of organic production, requirements for crop production and processing practices, labeling,

inspection and certification protocols. However, unlike those of IFOAM they do not cover animal husbandry. The Codex guidelines provide an internationally agreed framework for organic food in international trade. Where a disagreement may occur between countries about the equivalence of organic food, the Codex guidelines can be used as a reference in trade disputes at the WTO level. Most governments define organic farming consistent with the broad definition given by the FAO and IFOAM. These definitions are followed by the national accreditation boards and certifying agencies in the process of certifying organic products.

Box 1. IFOAM's standards and principles of organic farming (IFOAM 2002):

- *to produce sufficient quantities of high quality food, fiber and other products.*
- *to work compatibly with natural cycles and living systems through the soil, plants and animals in the entire production system.*
- *to recognize the wider social and ecological impact of and within the organic production and processing system.*
- *to maintain and increase long-term fertility and biological activity of soils using locally adapted cultural, biological and mechanical methods as opposed to reliance on inputs.*
- *to maintain and encourage agricultural and natural biodiversity on the farm and surrounds through the use of sustainable production systems and the protection of plant and wildlife habitats.*
- *to maintain and conserve genetic diversity through attention to on-farm management of genetic resources.*
- *to promote the responsible use and conservation of water and all life therein.*
- *to use, as far as possible, renewable resources in production and processing systems and avoid pollution and waste.*
- *to foster local and regional production and distribution.*
- *to create a harmonious balance between crop production and animal husbandry.*
- *to provide living conditions that allow animals to express the basic aspects of their innate behavior.*
- *to utilize biodegradable, recyclable and recycled packaging materials.*
- *to provide everyone involved in organic farming and processing with a quality of life that satisfies their basic needs, within a safe, secure and healthy working environment.*
- *to support the establishment of an entire production, processing and distribution chain which is both socially just and ecologically responsible.*
- *to recognize the importance of, and protect and learn from, indigenous knowledge and traditional farming systems.*

There are several important questions related to the practice of organic methods, for example, yields and environmental benefits. Many studies have examined the yield potential of organic cultivation. Most of the studies done in Europe or the US suggest a reduction in yield for most crops in comparison to conventional agriculture, particularly in the first two or three years following conversion (for review see Lotter 2003). However, the specifics are crop and agro-climatically dependent. A survey of about 200 projects in developing countries in which contemporary organic practices were introduced showed increase in average yield between 5 to 10 percent in irrigated crops and 50 to 100 percent in rainfed crops (Pretty and Hine 2001). Studies have shown that organic farms are less sensitive to climate variability than conventional farms (Welsh, 1999; Drinkwater et al., 1998), and organic cropping reduces the variability in net returns (Helmers et al. 1986). Since organic farms are generally as profitable as conventional farming and less sensitive to climatic variability, the need for insurance payments can be reduced. In some cases, organic farming has lead to reductions in government farm payments (Lampkin et al. 1999). In terms of environmental sustainability many studies have also been done taking into consideration a large variety of agro-environmental indicators, such as soil organic matter, soil moisture, soil nutrients and biodiversity. Most indicators suggest that organic farming is less environmentally damaging than conventional farming and improve agro-environmental conditions (for review see Lotter 2003).

3. Agriculture in India and Canada: A Comparative Profile

Agriculture in India, like many countries of the south, continues to play an important role in economic growth. However, in Canada, like many countries of the north, represents only a small proportion of the economy. This is demonstrated by the fact that agriculture sector contributes about 19 and 1.3 percent of the Gross Domestic product (GDP) in India and Canada, respectively.

With over one-half of the population deriving their livelihood from agriculture, the primary sector is vital in shaping India's economic development (Box 2). Since the late 1960s, major strides in terms of agricultural production and yield have been achieved through the application of green revolution inputs and improved cultivation practices. Total foodgrain production increased to over 211 million tonnes in 2001-02 from around 100 million tonnes in 1969-70. To a large extent, the growth in food grain production has been contributed by green revolution

yield augmenting technologies, which involve more intensive use of irrigation, chemical fertilizer and pesticides. The phenomenal growth in production, of course, has provided food security ending India's dependence on imports and aid, while increasing agricultural exports.

Box 2 Agriculture and Natural Resources in India and Canada: A comparative profile

Index	India	Canada
Population ('000,000)	1,027	32
Land area (M. ha)	328.0	909.0
Density (per sq. km)	312.0	3.1
Land Use (percent of Land area) – data relate to 2001		
Wooded Area	21.0	44.0
Permanent Grassland	3.3	1.7
Net Sown Area (NSA)	43.0 (141.35 Mha)	3.3 (29.7 Mha)
Gross Sown Area	56.3 (187.91 Mha)	4.0 (36.4 Mha)
Percent of Irrigated Area in NSA	40.5	1.9
Percent of workers in Agriculture	53.0	2.8
Average landholding size (ha)	1.4	273.0
Inputs Use (data relate to 2001)		
NPK (total nitrogen, phosphate and potassium fertilizer) use on NSA ('000 tonnes)	17,300	4,300
NPK use (kg/ha)	95.0	104
Pesticide consumption (tonnes)	107,864	42,000
Pesticide/NSA (kg/ha)	0.8	1.02
Yield (kg/ha) – (India – 2001; Canada - average 1991 to 2001)		
Rice	2,090	-
Wheat	2,770	2,353
Maize/Corn	1642	6,600
Canola	-	1,641
Soyabean	900	538
Production		
Cereals ('000 tonnes)	212,000	42,000
Cereal per capita (kg/persons)	200	1,312
Oilseeds ('000 tonnes)	33,624	10,800
Agricultural Trade (2001)		
Agricultural Imports ('000,000 USD)	3405.6	11,200
Agricultural Exports ('000,000 USD)	7425.3	17,010

Sources: Statistics Canada, OECD, Canadian Commissioner of the Environment and Sustainable Development.
Agricultural Statistics, Government of India
Compendium of Environment Statistics India, Government of India
Economic Survey, Government of India
Currency conversion: 1 CAD = 35.6 Rs; 1 Rs = 0.0228 USD; 1 CAD = 0.81 USD

Beside a small contribution to the Canadian GDP, the agricultural sector provides employment to less than 5 percent of the population. Notwithstanding the limited impact on the overall economy, the sector remains vital to the rural economy. Since middle of the twentieth century, agricultural production and yields have steadily increased with synthetic inputs, new seed varieties and improved cultivation practices. From the early 1960s to the late 1990s, agricultural productivity grew on average by about 1 percent per annum (Statistics Canada, 1999). Agricultural support payments[3] encouraged expanded production and increased agricultural-export surpluses (OECD, 2002).

The comparative picture depicted in Box 2 highlights some important differences between Indian and Canadian agriculture:

- India has about a third as much land area as Canada, while its population is about 30 times larger. The population density of India is thus much higher i.e. 312 vs. 3.1 persons per square km.

- Despite the smaller geographical area, India has both a significantly larger area and proportion of area under cultivation (i.e. 43%); the proportion is less than 5 percent in Canada.

- The average farm area is much larger in Canada (i.e. 195 times) than in India. The average land holding size is 1.4 hectare in India as compared to 273 hectare in Canada.

- Irrigation capacity differs greatly between the two countries with India having a much larger proportion of land under irrigation. This is due to significant difference in the pattern of precipitation, which is spread over large number of days during a year in Canada's case versus length of growing season.

- The average consumption of chemical fertilizers (NPK) and pesticides is similar in India and Canada. This is quite different from the generally observed pattern of input intensive agricultural practices in developed countries in the north. In that sense Canada is an important exception as it has in this way succeeded in containing intensification.

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[3] Support payments as according to the OECD's Producer Support Estimate accounted for approximately 30 percent of the value of agricultural production in the early 1990s – it was reduced to approximately 20 percent by 2002 (OECD, 2002).

- Not surprisingly therefore, yields of wheat, a major crop in both countries, are similar.

- Yet due to differences in population and cropping patterns the per capita cereal production is six times higher in Canada than in India reflecting a difference of over 1000 kg per person per year.

This comparison highlights some of the glaring differences not only in terms of the magnitude of resource use, but also in terms of use of chemical inputs. For instance, with a somewhat similar level of NPK use per hectare, the total quantum of fertilizer use in India is more than three times that in Canada. A substantially large proportion of cultivated land in India does not receive any chemical fertilizer, for reasons like lack of timely availability, non-affordability and lack of irrigation facilities. As such, the average NPK use per hectare on fertilised land is likely to be much higher in India as compared to that in Canada. This provides some indication that Canada has limited its agricultural intensification. It is in this backdrop, the subsequent analysis of the challenges as well as policy initiatives for promoting sustainable agriculture in India and Canada may have special significance.

4. India – Policies for Sustainable Agriculture and Organic Farming

The Indian government's policies have always emphasized food grain self-sufficiency, which has not necessarily coincided with agricultural sustainability. The growth of agricultural production and productivity, which had risen significantly during 1970s and 1980s, declined during 1990s[4]. These slowdowns have worsened since 2000, both overall agricultural production and foodgrains production have shown negative growth rates in 2000-01 to 2002-03 period (GoI 2002). Decline in the growth rates of agricultural production and productivity is a serious issue considering the questions of food security, livelihood, and environment. As such, a critical examination of the approaches for sustainable

[4] The overall growth rate of crop production declined from 3.19 percent per annum during 1980s (1980-81 to 1989-90) to 2.28 percent per annum during 1990s (1990-91 to 1999-00), while yield growth decreased from 2.56 percent per annum to 1.31 percent per annum. In terms of food grain production, the production growth rate of foodgrains declined to 1.94 percent per annum during the 1990s from 2.85 per annum in 1980s.

agricultural development is necessary. This examination must be framed not only by India's ongoing need to ensure food self-sufficiency but also by the consequences of access to international markets.

4.1 Environmental Challenges in Indian Agriculture

The challenge for Indian agriculture, to put simply, is to increase production, while minimizing environmental impact. This includes conserving and protecting the quality of the resources that determine the performance of agriculture like land, water and air. Reductions in yield, although determined by many factors, may be partially a consequence of land and water exploitation.

Land degradation[5] is one major constraint for Indian agriculture. By the early 1980s approximately 53 percent (173.6 million hectares) of India's geographical area had been considered degraded according to the Ministry of Agriculture (GoI, 2001a): Water logging affected about 6 percent of the cultivated area, while alkali and acidic soils both affected about 3 percent. The major process of land degradation is soil erosion (due to water and wind erosion) contributing to over 71 percent of the land degradation (GoI 2001a). Data compiled by the National Remote Sensing Agency (NRSA) indicated that 15 percent of India's total geographical area was comprised of degraded cultivatable wasteland[6] (NRSA 2000). One third of this land was degraded by human activities, while nearly one half was degraded by a combination of human and natural causes (NRSA 2000). Chadha et al. (2004) found a negative and significant negative relationship between land degradation and foodgrain productivity in both the 1980s and 1990s.

Water is another major constraint for Indian agriculture. Agriculture, through irrigation, accounted for 83 percent of the total water use in the country during 1990 (Vyas 2003). During the Green Revolution period water consumption in

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5 Land degradation generally refers to a reduction in the productivity and complexity of any type of terrestrial ecosystem. The degradation is a result of compromised soil quality usually due to erosion, the deterioration of the chemical, physical and biological soil properties and/or long-term loss of natural vegetation. The processes leading to degradation can be, and often are, a direct result of human activities.

6 Wasteland is considered under-utilized degraded land deteriorating due to poor management or natural causes that could be brought under vegetative cover with reasonable effort (NRSA 2000).

agriculture rose sharply as the net irrigated area increased from 31.1 to 54.68 million hectares between 1970-71 and 2000-01, while the area irrigated more than once per year increased from 7.09 million to 20.46 million hectares during the same period. Groundwater, one of the India's major sources for irrigation[7], is being rapidly depleted. The number of dark blocks (taluk or mandals), where groundwater extraction is more than 85 percent of the availability, increased from 253 to 428 out of over 5700 blocks between 1984-85 and 1998-99 (GoI 2002). The problem of groundwater depletion has been reported from rainfed states like Andhra Pradesh, Karnataka, Rajastan, Madhya Pradesh, Chattisgarh and Gujarat.

The introduction of modern technology based agricultural systems, in addition to encouraging increased water usage, meant the application of inputs like chemical fertilizers, chemical pesticides and high yielding varieties (HYVs) . Fertilizer application rose more than five-fold between 1970 and 2002 to 17360 thousand tonnes. Imbalanced proportioning[8] of chemical nutrients is a major problem associated with fertilizer application in India. Pesticide consumption increased from 24.32 million tonnes in 1970-71 to 46.2 million tonnes in 1999-00, with a peak application of 75.42 million tonnes during 1988-89 (CSE 1999). High yielding seed varieties have lead to mono-cropping of certain grains reducing farmers' cropping flexibility and reducing agricultural biodiversity.

Although, the Indian government has recognized the necessity of managing and conserving resources for agricultural development since the First Five Year Plan[9], the measures initiated have been inadequate. For example, the

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7 In recent years, ground water has provided about 55 percent of irrigation water versus 38 percent in 1970-71 (Vyas 2003).

8 The desirable ratio of nitrogenous, phosphatic and potassic fertilizers is 4:2:1, respectively, but the actual application during 2001-02 was 6.69:2.59:1.0 (GoI 2002).

9 Soil and Water Conservation Programmes were initiated during the First Plan period and they have been progressively intensified over the successive Plan periods. During the First and Second Plan periods, soil conservation works mainly constituted of contour bunding and some afforestation of denuded areas. During the Third and Fourth Plan, a centrally sponsored scheme of soil conservation in catchments of 21 river valley projects was undertaken. From the Fifth Plan onwards, soil and water conservation programmes were taken using a watershed approach. Other measures include the setting up of the All India Soil and Land Use Survey Organisation and State Land Use Boards to take an overall view of the land

government's efforts have only been able to regenerate 17.28 percent of the total degraded area (173.6 million hectares; GoI 2001a).

India's National Agricultural Policy (NAP) (GoI 2000) has stressed the importance of management and conservation of resources by stating that, 'the policy will seek to promote technically sound, economically viable, environmentally non-degrading, and socially acceptable use of country's natural resources – land, water and genetic endowment to promote sustainable development of agriculture'. The Central and state governments have initiated several measures to promote sustainable agricultural development. The NAP stated that improving the quality of land and soil, rational utilisation and conservation of water, and sensitizing the farming community to environmental concerns would receive high priority (GoI 2000).

The Tenth Five Year Plan (GoI 2002), for 2002 through 2007, has put emphasis on natural resource management through rainwater harvesting, groundwater recharging measures and controlling groundwater exploitation, watershed development, treatment of waterlogged areas. With regard to application of agricultural inputs like fertilizer and pesticides, the Plan stated that factors such as imbalanced use of nitrogenous (N), phosphatic (P) and postassic (K), increased deficiency of micronutrients and decreased soil organic carbon would be addressed through a holistic agri-environmental approach stressing Integrated Plant Nutrient and Pest Management. Further, the Tenth Plan document recognizes organic farming as a 'thrust area' in the sustainable use and management of resources in agriculture.

4.2 Promoting Organic Farming in India

Realizing the challenges facing Indian agriculture, the Central and state governments, non-governmental organisations, civil society groups and concerned individuals are promoting organic farming. Economic and environmental factors have motivated the Indian Government to promote organic

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use and conservation problems. The Seventh Plan besides continuing the previous initiatives, laid emphasis on reclamation of alkali soils, control of shifting cultivation and maintenance of the works already completed. Realising the necessity of community involvement, the Eighth Plan encouraged the participation of people and voluntary organisations in soil conservation measures. The Eighth Plan also stressed the requirement of Integrated Pest Management (IPM) for controlling pests by using less chemical pesticides to reduce environmental pollution.

farming. Perhaps, its major motivator in encouraging organic farming is to capitalize on the burgeoning global organic market, which was estimated at US$ 23 billion in 2002[10]. The global market for organic products is expected to grow over the medium term from 10 to 30 percent (Yussefi and Willer 2002, as quoted in Garibay and Jyoti 2003). There is a large gap between the supply and demand of various organic products. This vast market opportunity, combined with high price premiums of organic products over conventional products, has attracted many developing countries, including India, to encourage organic farming.

The Indian Government has initiated various promotional activities, such as setting up a National Institute of Organic Farming in Ghaziabad, Uttar Pradesh in 2003, appointment of accreditation and certifying agencies for organic farm products, developing norms for certifying organic products and providing financial support to implement promotional activities for organic farming.

Many state governments have also encouraged farmers to adopt organic farming, by including organic farming as a component in their State Agricultural policies. The Governments of Maharashtra, Karnataka, Madhya Pradesh, Gujarat, Tamil Nadu and Kerala have included organic farming in their agricultural policies. Karnataka and Maharashtra have provided Rs. 20 crores and Rs. 10 crores respectively for promoting organic method, and Uttaranchal and Mizoram have declared themselves "fully organic farming states" (Venkateshwarlu 2004). The Kerala Government also has launched a programme and policy for “Organic Sustainability of Kerala” or “Jaivakeralam” to promote and popularize organic farming. The Government stated that it would compensate losses during conversion period, besides extending its support to farmers in certification, organic manure production and marketing (Surendranath 2003).

Apart from State initiatives, many farmers have shifted to organic farming either on their own accord or with support from NGOs and civil society groups. Farmers’ motivations for shifting from intensive practices to organic practices are various. A survey conducted in Gujarat and Karnataka revealed that three factors influenced farmers’ transition to organic farming: (1) Environmental problems associated with intensive agriculture; (2) Institutional factors, such as NGOs

[10] Over 93 percent of the market was in the EU and US – where growth was 8 and 12 percent respectively in 2002; Willer and Yussefi 2004

intervention (3) Own initiatives by farmers owing to philosophical influence (Puttaswamaiah 2005).

4.3 Extent of Indian Organic Area and Production

Currently, the extent of certified organic farming in terms of area and production is small in India. The total area covered by certified organic farms in the country is about 37050 hectares, which accounts for about 0.03 percent of the total agricultural area, while the total number of farmers is about 5147 (Willer and Yussefi 2004). In comparison to the total agricultural production of over 200 million tonnes, the country produced only about 14000 tonnes of organic food products from about 1426 certified organic farms (Brook and Bhagat 2004). Many crops are however cultivated under organic farming methods in the country (GoI 2001b):

1. Cereals: wheat, paddy, jowar, bajra, maize
2. Pulses: pigeonpea, chickpea, greengram, blackgram, chana
3. Oilseeds: groundnut, castor, mustard, sesame
4. Commodities: cotton, sugarcane, particularly for sugarcandy (gur)
5. Spices: ginger, turmeric, chillies, cumin
6. Plantation crops: tea, Coffee, Cardamom
7. Fruits: banana, sapota, custard apple and papaya
8. Vegetables: tomato, brinjal, cucurbits, cole crops, leafy vegetables

Although organic in the sense of non-chemical farming is obviously not new in India, in its modern sense it is a recent development. The majority Indian farmers have not adopted the intensive green revolution technologies, particularly in some of the north and northeastern states and in that sense have been described as being ‘organic by default’ (Brook and Bhagat 2004). This is often because of modern inputs are unaffordable or farmers prefer to farm in their traditional manner. Despite the lack of chemicals, however, their methods of farming are not necessarily inherently sustainable. With regard to this point, the IFOAM’s Hanoi Declaration stated: ‘the Asian history of agriculture spanning into thousands of years is in deep connection with cultural and ecological diversity, but the erstwhile colonial rule as well as misdirected policies have undermined this balance’ (GoI 2001b). The requirement of strict adherence to the procedures of modern organic farming and certification of the product keeps large number of

"organic by default" Indian farmers outside the brand labeled by modern organic practices.

Few empirical farm-level studies have been done in India to examine the productivity and profitability of organic farming as compared to "organic by default" or input-intensive conventional farming. In terms of cotton cultivation, field trials have been done by the Central Institute for Cotton Research (CICR), Nagpur. The results suggest that during the first one or two years following conversion, yields were much smaller than control group non-organic yields; however, in subsequent years yields were similar and even higher than non-organic yields (CICR 2000). The CICR report (2000) notes that organic cultivation improved soil health, reduced environmental pollution and the cost of cultivation.

4.4 Organic Certification and Marketing in India

As organic farming is making only a small dent in Indian agricultural practices in the recent years, market for organic products remains at an evolutionary stage. Organic outlets are sure to be found in major urban centres like Mumbai, Bangalore, Delhi, Chennai, Hyderabad, and Ahmedabad. In smaller centers the coverage is spotty and the market often non-existent.

To be branded "organic" produce must go through several procedures from field to market, unlike the traditional produce. These procedures are outlined in the Central Government's norms and standards for certifying organic products, which are equivalent to international standards of the FAO (Codex Alimentarius) for preparation and marketing of organic products.

The Ministry of Commerce has identified six organisations as accreditation agencies of organic products, they are (1) Agricultural and Processed Food Products Export Development Authority (APEDA), (2) Tea Board, (3) Spices Board, (4) Coconut Development Board, (5) Directorate of Cashew and Cocoa, and (6) Coffee Board. These accreditation boards give permission to certifying agencies for certifying organic products, following the prescribed norms. Certification through these boards and agencies has been made compulsory, particularly for export market, as 'the Government of India has issued a public notice according to which no certified organic products may be exported unless they are certified by an inspection and certifying agency duly accredited by one

of the accreditation agencies designated by the Government of India' (Garibay and Jyoti, 2003). Several certifying agencies are functioning in India.

The growth of organic farming is dependent on market development, both international and domestic. Currently most of the Indian organic production is sent for export. The domestic market consumes only about 7.5 percent of the organic production (Garibay and Jyoti, 2003). However, it is projected that the domestic organic market will increase by 49 percent by 2006-07 (1568 tonnes) over 2002 (1050 tonnes) (Garibay and Jyoti, 2003).

India has a comparative advantage as compared to northern countries, in the production of many agricultural products, such as tea, spices, coffee, fruits and vegetables, rice and ayurvedic herbs (Garibay and Jyoti, 2003). As such, India has been promoting organic produce for export markets. Particularly since, relative to domestic market, demand is higher internationally. The export market for Indian products is expected to rise by 80 percent by 2006-07 (21525 tonnes) over 2002 (11925 tonnes) (Garibay and Jyoti, 2003).

Despite the relatively small domestic demand, organic products can command price premiums in Indian markets. For instance, in Mumbai the price of organic products have been reported to almost double the price of conventional agricultural products (Garibay and Jyoti 2003). Internationally, the price premiums obtained for organic products generally ranges between 30 to 50 percent (trade level) (Garibay and Jyoti 2003).

Clearly, organic farming in its modern sense is taking hold in India for both financial and environmental reasons. The growth in the next years has been projected to be significant – however there are clearly major challenges facing the Indian organic movement.

4.5 Challenges for Indian Organic Farming

Organic farming in the Indian context has to resolve several issues at both micro and macro level. The micro level issues confronting organic farming include economic viability, particularly for small and marginal farmers, marketing, etc. For example, one of the greatest barriers for organic farming is the so-called conversion period due to the direct and indirect costs. The conversion of a conventional farm to an organic farm requires strictly adhering the rules and

standards of production, processing and labeling at prescribed international levels. During the conversion period all the standards required for certifying a product as 'organic' must be fulfilled and verified by a certifying agency. Costs due to things such as information, marketing charges, inspection and certification expenses also increase the cost of organic farming. For instance, fees for the inspection and certification can be prohibitively high at Rs. 5000, since this equals the returns from agriculture for many small farmers (Brook and Bhagat 2004). The often reduced yields of organic farming, as compared to conventional farming particularly during the conversion period before soil nutrients and organic matter are replenished with biofertilizers, are an additional liability to the farmer. Particularly during the conversion period when the products are not certified as organic, and thus, they cannot be sold at the organic market price. Farmers often incur expenditures for things such as farm machinery, bunding, purchase of bio-inputs to augment soil fertility and yield. In addition, various barriers like transaction costs (lack of access to relevant knowledge on cultivation practices, market), mandatory documentation required for inspection and certification, lack of demand in domestic market and constraints to enter international market and institutional factors restrict the spread of organic farming (Das 2004).

The macro challenges include impacts mainly on food security, employment, and environment. The question of food security assumes significance considering potential yield reductions of organic farming vis-à-vis conventional farming, particularly in the two to three year conversion period. Given India's history of inadequate food production, it is necessary to examine food security related issues, taking into account the large number of marginal and small farmers, before organic farming is promoted en masse. Another macro dimension of promoting organic farming is its impacts on rural employment. Organic farming is expected to increase employment opportunities owing to requirement of producing various agricultural inputs, like bio-fertilisers and bio-pesticides, using locally available materials. The scope for increased employment opportunities needs to be assessed at the regional and national level. From the environmental point of view, apprehensions have been raised that organic farming might also lead to unsustainable problems, due to increased land and water use to offset decreases in yield. Considering the Indian case, even in organic practices water conservation must ultimately remain the paramount concern.

Considering the various challenges to the adoption of organic farming the Working Group on Organic and Bio-dynamic Farming of the Planning

Commission (GoI 2001b) suggested examination of some important issues for effective promotion and practice of organic farming and sustainable agriculture. These include, economics of organic crop production, economic and environmental externalities associated with conversion to organic farming, comparative study of chemical based and organic farming covering social, environmental and economic costs.

5. Canada – Policies for Sustainable Agriculture and Organic Farming

5.1 Environmental Challenges in Canadian Agriculture

Concern for the environmental sustainability of Canadian agriculture is not a recent phenomenon. With repetitive droughts during the "Dust Bowl" of the 1930s, it was realized that farm practices could endanger the long-term viability of Canadian agriculture. At that time, the Prairie Farm Rehabilitation Administration was developed to address poor land conditions. Unsurprisingly agricultural intensification generated environmental costs. In the early 1980s, a report by a Senate Standing Committee on Agriculture (1984) stated that soil degradation needed to be addressed estimating its costs to Canadian Agriculture in hundreds of millions of dollars. In 1990, a joint Federal-Provincial Agricultural Committee dedicated to environmental sustainability reported on agri-environmental concerns such as water contamination, habitat destruction, reduced biodiversity, and greenhouse gas emissions. The report suggested implementation of policies to ameliorate growing agri-environmental concerns.

In 1993, the federal department of Agriculture and Agri-Food Canada (AAFC) initiated a program to measure and monitor environmental indicators sensitive to agricultural practices. The first report took seven years to complete, but the results are to date the most comprehensive enumeration of Canadian agriculture's environmental impacts (MacRae et al., 2000). The report presented mixed trends suggesting that Canadian agriculture has been moving towards sustainability in some ways while in others it has been drifting further away.

The increased sustainability in Canadian agriculture between 1981 and 1996 has been largely attributed to the increased usage of environmental farm practices

such as conservation tillage[11] or no-till[12] farming and reduced summer-fallow (Huffman, 2000). In the Prairies[13] for instance, the area of cropland under conservation tillage or direct seeding practices increased from 32 to 48 percent during the 1991 to 1996 period (Huffman, 2000). The average number of bare-soil days[14] in Canada dropped by 20 percent, from 98 to 78 days, between 1981 and 1996 (Huffman, 2000). In 1996, less than 15 percent of Canadian cropland was at risk of water erosion, down from 30 percent in 1981 (Shelton et al., 2000), while the proportion of Prairie cropland at risk of wind erosion dropped from 60 to 35 percent (Padbury and Stushnoff, 2000). These improvements did not affect an overall change in the soil-salt balance. Between 1981 and 1996, the proportion of Prairie soil susceptible to salinization remained the same at about 16 percent (Eilers et al., 2000). However due to the increased adoption of no-till practices, the loss of soil organic carbon from Canadian soils, estimated to be 43 kg/ha in 1990, was projected to reduce to zero by 2000 (Smith et al., 2000).

Despite the significant reductions in the risk of soil erosion and loss of soil organic carbon, the Commissioner of the Environment and Sustainable Development aptly pointed out that it could still take up to 90 years to bring soil erosion to fully sustainable levels (Gélinas, 2001). Due to budget cuts in the mid-1990s, the national soil survey program was largely dismantled (Gélinas, 2001). This will make it difficult to assess the progress of Canadian soils. Agricultural wildlife also was assessed to have benefited from the reduction in the number of bare-soil days. Due to the reduction of summer-fallow, wildlife habitat in most agricultural regions either improved or remained the same – habitat decreased in

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11 Conservation tillage refers to tilling practices that reduce soil erosion. More formally defined as a tillage-and-planting combination that leaves at least 30 percent cover of crop residue on the soil surface to reduce erosion.

12 No-till or zero-tillage eliminates soil tilling after harvest and the subsequent crop is planted directly into the soil – often using a special planter.

13 The Prairies refers to the agricultural land in the so-called Prairie provinces of Manitoba, Saskatchewan and Alberta. The Prairies are a swath of grassland and aspen parkland that ranges from the Rocky Mountains to the Canadian Shield east of Lake Winnipeg. This ecozone is characterized by a relatively flat topography and semi-arid climate. Farmland makes up 90 percent of this area, and this farmland makes up two-thirds of all Canadian farmland.

14 Bare-soil day refers to a day equivalent, two half-days for example, in which the soil is not covered by crop or crop residue and thus fully exposed to the forces of erosion.

only a few areas (Neave et al., 2000). Both improved wildlife habitat and increased crop diversification in the Prairies were considered to have increased biodiversity (Neave et al., 2000).

Several government policies have been considered successful in leading agriculture towards sustainability (WWFC, 2003). Government conservation tillage and crop diversification programs have benefited soils and biodiversity. Programs promoting Environmental Farm Plans have engaged thousands of farmers in the particulars of good agri-environmental practices (Koroluk et al., 2000). Under the Government's Agricultural Policy Framework (AAFC 2003) each farm is to undergo an environmental "farm scan". If the "scan" deems it necessary, an appropriate Environmental Farm Plan will be developed for the farm's particular environmental problems and followed up by Plan implementation and then subsequent follow up inspections. This ambitious goal could rectify many of the environmental problems associated with Canadian agriculture.

Despite the positive steps that Canadian agriculture has taken in the direction of sustainability, several indicators suggest that in many ways it is increasingly contributing to environmental degradation. Between 1981 and 1996, soils in nine out of ten provinces had increased nitrogen residues (MacDonald, 2000a), and water in many regions had increased nitrogen and phosphorous contamination (MacDonald, 2000b, Bolinder et al, 2000). These trends are consistent with the increased rate of fertilizer consumption during this period in Canada (FAOSTAT data, 2004).

Agricultural water usage increased from the early 1980s to the late 1990s by 15 percent to 3991 million cubic meters per annum (OECD, 2001), accounting for about 9 percent of all water withdrawn in Canada (AAFC, 2003). While agricultural energy consumption increased by eight percent to 360 petajoules between 1981 and 1996 (MacGregor et al., 2000), agricultural greenhouse gas emissions increased by 3.5 percent to 86 megatonnes of carbon dioxide equivalent accounting for 13 percent of all Canadian emissions (Desjardins and Riznek, 2000). Nitrogen fertilizers contribute most of the cropping sector's emissions (12 megatonnes of carbon dioxide equivalency in 1996; Desjardins and Riznek, 2000). Livestock waste products contribute the largest component to agriculture's overall emissions (over 35 megatonnes of carbon dioxide equivalent; Desjardins and Riznek, 2000).

The environmental impact of the livestock sector is increasing with larger numbers of animals and the trend towards large-scale intensive livestock operations. This combination has meant increased risks from waste products over the last two decades. The waste products from these livestock operations are considerable. For example, livestock operations in Ontario and Quebec generate enough manure to equal the sewage from over 100 million people. When waste products are not properly managed, pathogens can contaminate water sources putting local populations at risk. The contamination of drinking water with *E. coli* that killed several residents of Walkerton, Ontario, in May 2000, is suspected to be related to livestock manure runoff contaminating ground water (Miller, 2000). Mismanagement of waste products can also result in nitrogen contamination of water and in unnecessary green house gas emissions. Moreover improper storage of wastes results in odours that can be a nuisance to local communities. Although AAFC and Environment Canada have offered financial incentives and promoted good practices to encourage good management of manure, there are still ongoing reports of manure mismanagement.

Although pesticide consumption decreased throughout the 1980s and 1990s, the consumption again increased to its highest levels after the millennium (OECD, 2001; OECD, 2004). Reports linking overuse of pesticides to "fish kills"[15] in creeks and streams served as a reminder of the continued usage of dangerous levels of pesticides on some crops (FAE, 1998; FAE, 2003). The increased pesticide usage may be associated with the greater adoption of conservation tillage practices, which use herbicide application for weed control.

The Canadian Commissioner of the Environment and Sustainable Development has pointed out several policy barriers in the move towards sustainability (Gélinas, 2001). Agriculture Canada's goal of increasing Canada's share of global exports to four percent is a recipe for increased intensification of agriculture and runs counter to the Department's goal of increasing sustainability of agriculture. In 2003-2004, the total amount (provincial and federal) devoted to farm income support and crop insurance was about 4,000 million Canadian dollars much larger than that given for environmental programs which totaled

[15] Fish kills refer to unusual en masse fish mortality localized to a certain body of water. Fish kills have often been associated with water contamination by pesticides or nutrients. Nutrient contamination is an indirect cause of fish death usually in response to reduced water oxygen levels due to excessive aquatic plant growth.

about 132 million Canadian dollars (AAFC, 2004). The funding for agri-environmental programs has been erratic with funding increasing and decreasing repeatedly since the early 1990s (AAFC, 1997, 2001a, 2004). In general, the Department of Agriculture has failed to evaluate the environmental consequences of existing and planned policies and programs – including the delivery of support payments and crop insurance. Most of its policies directed at environmental stewardship have been voluntary and have not necessarily addressed the most serious agri-environmental problems. Most of the direct support has been through grants rather than comprehensive or targeted programs and funding. As such, implementation of improvement programs has been spotty. While the federal government's most recent Agricultural Policy Framework (APF) sets out ambitious, comprehensive targets – results from this program have yet to emerge.

5.2 Promoting Organic Farming in Canada

Organic farming is, to many, the obvious way to mitigate Canada's agri-environmental problems, while providing consumers with the product they seem to want. It has been reported that approximately 75 percent of Canadian consumers are concerned about chemicals in their food (MacRae, 2002), and environmental concerns are a key motivating factor for many organic shoppers (Hartman Group, 2000).

Although organic farming has played a role in Canadian farming for over forty years, it was during the 1990s that consumer interest invigorated the organic market spurring domestic production. The total number of organic farms increased over 150 percent between 1992 and 2003 (Macey, 2004). The main reasons Canadian farmers give for adopting organic practices seem to be similar reasons given by consumers for shifting to organic produce. They cite concerns about the effects of chemicals on health and the effects of conventional farming on soil quality and conservation (Hall and Mogyorody, 2000).

5.3 Extent of Canadian Organic Area and Production

In 2003, 3134 certified organic farms totaling 391,000 hectares represented approximately 1.3 percent of all Canadian farms and about 1 percent of crop area (Macey, 2004). The organic movement has consisted largely of regional voluntary and civil society groups. However, the Canadian Organic Growers'

Association has given the movement a national perspective. The federal government has encouraged the organic farming sector in Canada through direct support to fund several projects, including the establishment of the Organic Agriculture Centre of Canada for organic research and education.

A comprehensive overview of the Canadian organic industry is problematic since detailed information on production and sales of organic produce is unavailable. Most organic certifying agencies do not collect production or sales information. Although the Canadian Organic Growers Association tracks the number of certified farms, it does not collect statistics on production area, quantity or value. So at present, it is impossible to accurately determine total organic farm production, organic farm-gate receipts or organic retail receipts. In 2003, estimates suggest that the gross organic farm-gate production totaled at least 170 million Canadian dollars and retail sales totaled in the neighborhood of 800 million Canadian dollars (Macey, 2004).

Canadian organic farming has made the most significant progress in grain and horticulture production. Ranging from grains to fruits and vegetables, the crop area of organic produce generally represents between 1 to 2 percent of the total crop area (Macey, 2004). Area cropped, production, and farm-gate receipts are highest for grains. In 2000, the total production of organic grains and oilseeds in Canada was estimated at 140,000 tonnes valued at over 400 to 500 million Canadian dollars (Wasicuna and Harrison, 2000). While oilseeds make up 10 to 20 percent of organic grain production, wheat constitutes about one-half (Wasicuna and Harrison, 2000).

Animal products lag far behind cropped produce. Organic dairy cattle now make up about 0.05 percent of all Canadian dairy cattle, however organic meat production is much less developed (Macey, 2004). Organic poultry operations provide almost 0.5 percent of Canadian egg production (Macey, 2004).

Few empirical farm-level studies have been done in Canada to examine the productivity and profitability of organic farming as compared to conventional farming. In terms of food grains one study was done taking data from a small sample of organic farmers (n = 14) over a period of five years (Entz et al., 2001). The organic grain yields, of wheat, barley and oats, averaged about 75 percent those on conventional farms. The authors concluded that weeds were a major yield limiting factor and that in several incidents organic cropping coincided with

insufficient soil-phosphorous (Entz et al., 2001). Entz and co-authors (1997) noted that without the price premiums, which averaged over 250 Canadian dollars per hectare (making the prices of organic wheat to be greater than that of conventionally grown wheat), organic cropping would have rarely resulted in positive net returns. This study was meant to serve as a baseline for generating a database of organic farm data. Unfortunately, after the completion of the study most of the farmers were not interested in continuing to participate in developing the database (Entz personal communication). This underlines the difficulty in gathering reliable and comprehensive data on organic farming, which without the farmers' support is impossible.

5.4 Organic Certification and Marketing in Canada

In 1999, the Canadian General Standards Board published the National Standard of Canada for Organic Agriculture (CAN/CGSB-32.310-99) that conforms to the regulations outlined by the Codex Alimentarius Commission and was approved by the Standards Council of Canada (SCC). Certifying bodies are now accredited by the SCC the Conseil d'accrèditation du Québec, and the Certified Organic Assoication of British Columbia. Certifying bodies numbered nearly 50 in 2003 (Macey, 2004). The costs of certification are at least 400 to 500 Canadian dollars and depend on the specifics of the farm and certifier (Stoneman, 2001). Farmers, particularly fruit and vegetable producers who market their produce directly to the public, may not certify their farms as it is not perceived to provide them any benefit since they develop a direct trust-relationship with their clientele.

Organic sales have been growing steadily by as much as 20 percent per year according to most estimates (MacRae, 2002; Macey, 2004). The retail market for organic food in Canada is worth an estimated 300 to 800 million Canadian dollars. This market represents 1 percent of total retail food sales. The Canadian organic market has been developing at a faster rate than Canadian production. Approximately, 80 percent of organic products sold in Canada are imported, of which, 60 to 90 percent come from the US. Imports total more than 180 million Canadian dollars, and exports total approximately 63 million Canadian dollars (Macey, 2004). While the Canadian conventional agriculture sector is a net exporter, significantly contributing to Canada's trade surplus, the organic sector is a net importer. This rapidly expanding market should be an opportunity for Canadian producers.

Bringing together the producers and consumers remains a crucial concern for Canadian organic producers. Although the organic market is underdeveloped, it is becoming more mainstream. For instance, in 2000, 49 percent of organic purchases were made in mass-market outlets such as supermarkets or drug stores, while 48 percent were made in specialty stores (AAFC, 2001b).

Producers have an array of options in getting their products marketed. The Canadian Wheat Board (CWB) provides a separate channel for organic wheat and barley. For other grains and oilseeds there are several possibilities. Producers can clean the organic product privately or at a processing facility and privately or through a co-operative market the processed product. Alternatively, the producer can deliver the product directly to the end user where it will be cleaned, graded and purchased. For horticultural goods, given Canada's highly corporatized supermarket sector, it can be difficult for individual farmers or cooperatives to get access to shelf space in large supermarket chains. As a consequence, alternative markets have emerged but these tend only to work well when the distance between the farmers and consumers is small – that is near the large metro centers. Only about three percent of organic purchases were made at farmers' markets in 2000 (AAFC, 2001b). Milk and animal products are marketed through cooperatives in several regions of the country. Organic exports are dominated by grains and flours followed by processed food and beverages (Macey, 2004).

It has been reported that organic consumers are reluctant to pay prices more than 50 percent higher than those of non-organic products. In many regions, the retail price difference for many products is less than 15 percent. There are no nationally available figures, but on average, it has been estimated that a standard package of organic foods would cost about 25 percent more than conventional food (MacRae, 2002). However incentives paid out to farmers might be higher, for example, in 2002 the price paid for organic wheat was 75 percent greater than the price of conventional wheat price while that for organic flax was 200 percent (AAFC, 2002). Yet, premiums are not always offered to organic producers according to a study examining the payments to farmers who directly market their fruits and vegetables to the public (Parsons, 2004). The reasons for this are unclear but the possibilities are that product quality problems (aesthetic particularly – such as blemishes on fruits or vegetables) might force organic producers to reduce their prices since consumers may prefer perceived freshness and product aesthetics (Parsons, 2004). This seems to be a particularity for horticultural produce, although detailed studies have not been

conducted for other products. Forecasting organic farming's future profitability will require analysis of the volatility in the incentives associated with organic commodities.

5.5 Challenges for Canadian Organic Farming

Before farmers can fully capitalize on the organic market opportunities many barriers must be overcome. The barriers are present both for conventional farmers wishing to convert to organic farming and for those already practicing organic farming. Conventional producers are reluctant to convert to organic farming for several reasons. There is a general reduction in production capacity with organic farming. The productivity depends on the crop, cropping-rotation, livestock and many other variables. Organic wheat under Canadian Prairie conditions is typically expected to be 25 percent less productive than conventional wheat, whereas oilseeds may be 40 percent less productive and livestock or milk production may be 10 to 20 percent less productive (Entz, 2001; AAFC, 2002; MacRae, 2002). The reduced productivity is generally most pronounced during the so-called conversion period. During this conversion period (two to three years) certified "organic" price premiums are not granted making farmers doubly reluctant to convert. Other production concerns involve the increased need for labour and green manure crops, both of which may reduce organic farming's profitability. Other concerns associated with organic production often revolve around marketing issues. Some of the market obstacles include difficulties in producers finding buyers, difficulties in obtaining "organic" inputs such as biofertilizers and biopesticides, varying price incentives, undercompensation due to cheaper imports, and lack of organic processors and handlers. Governments elsewhere, including the US and Europe, have actively participated in the evolution of the organic sector. In comparison Canada has inadequately supported the Canadian organic sector. For example in contrast to the US and other countries, there are no incentives currently available to farmers for conversion to organic farming. More Canadian funding will be required to catapult the Canadian organic sector to the same level of that of many European countries and the US.

Organic farming in Canada poses an opportunity to solve two problems: the agri-environmental burden and shrinking farm and particularly small-farm incomes. The practices inherent to organic farming reduce environmental load, and the products derived from organic farming are increasingly demanded in the

marketplace. The price premiums consumers are willing to pay for a product they perceive as healthier, tastier and more environmentally friendly has proven to make organic farming economically viable. The Canadian government has few policies directed towards organic farming – increased governmental emphasis would aid in overcoming the organic-conversion barriers for interested conventional farmers. Several measures could rectify some of these issues. Conversion insurance programs have been used in other countries. These support the potential depressed earnings, or income 'gap', during the transition to organic farming. Financial incentives could be provided for mentoring and training payments to existing farmers, who often provide logistical support to transitional farmers. More advisory services need to be established to help both farmers and organic processors with quality assurance. Existing extension and research organizations should focus part of their efforts on organic agriculture. Without a further increase in conversion Canada will remain a large importer of organic produce – missing out on an economic and environmental opportunity.

6. Way Forward

The trajectory of Indian agriculture and its associated environmental problems has brought about recognition that future agricultural growth and productivity will have to occur simultaneously with environmental sustainability. The environmental challenges, especially in terms of land degradation and groundwater depletion, water logging and excessive use of chemical inputs are posing problems for the future of Indian agriculture. To address the problems, policies have laid emphasis on promoting sustainable agriculture including organic farming. Differential approaches and policy instruments, however, will be required to address these problems. The shift from input-intensive to sustainable, particularly organic farming is a difficult task as it involves a number of policy measures dealing with a variety of issues ranging from the transfer of information and technology to the development of markets. Another difficult task, and perhaps more difficult, relates to marginal and small farmers – which comprise a substantial part of Indian agriculture. Although these marginal and small farmers have been considered organic by `default', severe resource constraints make a shift to the modern sense of organic farming prohibitive. Against this, the experience with respect to sustainable farming in Canada provides an example how timely recognition of a crisis and proactive policy responses can minimize the negative environmental implications of input intensive agriculture. In the case

of soil erosion – policies promoting sustainable practices have done much to reduce the rate of soil degradation. Despite some positive steps towards limiting unsustainability, there is still much room for environmental stewardship in Canadian agriculture. In this respect, the expanding organic farming sector could significantly augment the sustainability of Canadian farming, while at the same time allow farmers to address a domestic organic supply deficit. However, policies must devote more incentives to overcome some of the financing constraints associated with the adoption of organic farming.

The Canadian experiences in terms general agricultural sustainability offer a few examples of good programmes that have provided farmers with information and incentives to minimize environmentally damaging practices that may be creatively adapted to the Indian scenario – such as Environmental Farm Planning.

Although it is not easy to draw obvious parallels between two such different countries, several concerns relating to sustainable agriculture and particularly the adoption of organic farming are common to both countries. Micro issues such as economic viability and uncertain outcomes with respect to farmer livelihoods are common in both countries. Of course in India, the potential consequences of such issues in terms of food security and entitlement are far more profound. The limited evidence from both India and Canada suggests that organic farming yields may be sufficient for viability of organic farming – particularly when parallel organic marketing channels are properly developed which provide price premiums to farmers. However, given the limited evidences in both the countries much research remains to be done. In India, the shift to `modern organic' agriculture, which tends to minimize yield variations in the face of climate fluctuations, may hold future promise for both drought prone marginal and small and input-intensive farmers.

Thus, certain common challenges exist. The policy makers, research and extension systems as well as civil society organisations in both countries need to pay immediate attention to the agri-environmental issues such as soil degradation, and in India's case water depletion.

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