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Food Security through Agricultural Sustainability: In Indian Context

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***Abstract*— India has enjoyed steady economic growth and has achieved self-sufficiency in grain production in recent years. Despite this, high levels of food insecurity, poverty and malnutrition persist. In recent times, food security issue has come to the fore front on national debate and discussion in India and is a matter of concern for all governments all over the world. The concept of food security is inherently interlinked with other challenges of economy like poverty, malnutrition, agriculture, climate change etc. Presently India ranks 97 out of 118 countries in Global Hunger Index (2016). Moreover, in Global Food Security Index, India ranks 74 out of 113 countries (2017). In fact India's progress in different sectors can be evaluated by the Human Development Report of the UN which ranked India 131 out of total 186 countries (2016). These rankings clearly shows that India is still far behind in inclusive development. Agriculture, along with its allied sectors, is the largest source of livelihood in India. Studies reveal that total food grain production during 2015-16 was estimated at 252.23 million tonnes, five times higher compared to 50 million tonnes in 1950-51. India has the world's largest area under cultivation for wheat, rice, and cotton, and is the world's largest producer of milk, pulses, and spices (World Bank 2012). However, a challenge for the Indian agricultural sector today is to feed its ever-growing population, even though India's food grain production has kept steady pace with its population. Studies shows that, there are many challenges which India faces in attaining food security like natural calamities, excessive rainfall, water shortages, recurrent drought, accessibility of water for irrigation purpose, soil erosion etc. Further, lack of improvement in agriculture technologies and facilities as well as population explosion also made food security more problematic.**

***Index Terms*—Irrigation, Agriculture, and cultivation.**

I. Introduction

Though the world has been changing remarkably over the past 25 years, food security still remains an unfulfilled dream for more than 800 million people living in the developing countries (Leisinger 1996). But the fact that the number of undernourished people has come down from the 1971 figure of 890 million, and that there has been an addition of 1.5 billion people to the population since 1971 show remarkable achievements in food security (FAO 1996 as cited in Leisinger 1996). In Asia, where nearly 73 percent of the population of the less developed world live (World Population Data Sheet 1996, as cited in Leisinger 1996), the number of undernourished people declined from 701 million in 1969-71 to 512 million in 1990-92. What is more notable is that the percentage of undernourished people in the region has fallen dramatically from 37 to 16 (based on FAO 1996), while the region's population is growing at the rate of 2 percent per annum. India wants to be self-sufficient in food and "food secured". Therefore, it is imperative for the national food security that we need to grow sufficient food within the country. At the same time, for domestic food security, we need to sustain economic growth to raise the income levels and purchasing power of the poor people. These apart, agricultural regulations through fixation of food grain procurement prices, regulation of consumer prices, and public distribution have an important role in ensuring food security at the domestic level, even if self-sufficiency is achieved in food grain at the national level (Banik 1997; Goyal 2002). Governments intervene and control a large proportion of the marketed food supply in order to safeguard the farmers against low and unpredictable prices for their produce; but, inefficient pricing often leads to undesirable consequences regarding access to food supplies. However, this dimension of the food security problem is beyond the scope of the paper (Banik 1997).

II. Conceptual Framework

The concept of food security has been evolved over the last quarter century. Food security concept has been considered at a number of levels: global, regional, national, state, household and individual. While the ultimate concern may be at the household and individual levels it is important to realize that food security at the levels outside the household because it has a strong bearing on the performance at the household level. Initially, food security means arrangements for providing physical supply of a minimum level of food grains at the national level, during all periods including those having harvest failures. It was subsequently recognized that physical availability alone would not ensure economic access to food for all the population, especially the poor and vulnerable sections. Thus it was emphasized that satisfactory production level and stability of supplies should be matched for reduction in poverty and an increase in the effective demand to ensure economic and physical access for the poor (FAO 1987). Food and Agricultural Organization (1981) termed the food security as a physical and economic access to food by all people at all times involved in concurrent step of production and consumption. It enlarged its

concept of food security by including three components:

- The ultimate objective to ensure all people at all times to have both economic and physical access to basic food they need;
- It should have specific aims namely ensuring production of adequate food supplies and access to available supplies; and
- Action should be needed on a wide front including all factors that have a bearing on capacity of both countries and people to produce or purchase food. The World Bank (1986) has slightly modified the concept and indicated that food security meant access by all people at all times to enough food for an active, healthy life. Its essential elements were the availability of food and the ability to acquire it.

Objectives of the Study

The major concerns of the paper are under the following objectives;

- To examine the extent of food security in India.
- To evaluate the measures taken under food security.
- To know about per capita food production in India over the years.
- To understand the need of sustainable agriculture to facilitate food security.'

Methodology

The study is fully based on the secondary data. Here the information's have been gathered from books, journals, publications, and websites.

III. Review of Literature

The problem of food security needs to be viewed basically in two dimensions, viz., macro level and micro level. Earlier studies on food security have focused on either of these two dimensions. The macro level studies generally deal with aggregate demand for and supply of food grains and other macro-economic variables at the national level. The micro level studies, generally deal with the question of household food security. There are several issues related to food security. Going by the broad definition of food security, three main issues relate to two aspects, viz., availability of food grains (physical access) and purchasing power (economic access). There is also a time dimension to the problem of food security, i.e., transitory food insecurity (short term) and chronic food insecurity (long term).The macro level studies related to food security in India deal mainly with growth in food grain production and self-sufficiency in relation to population growth. In the light of above discussion, an attempt is made to review various studies related to food security or alternatively, food insecurity. Food grains production in India is largely dependent on the rainfall pattern. As a result, there have been year to year fluctuations in the levels of output.

Bhatia (1967) highlights the nature and causes of famines from 1860 to 1943 in detail. The study has focused mainly on the government's role in overcoming the scarcity of food during periods of famine. In the study, famine has been defined as a state of extreme hunger suffered by the population of a region as a result of the failure of accustomed food supply.

The study finds that famines and food scarcity used to be a local phenomenon, but, the situation improved comparatively with the introduction of railways after 1853. During food crisis, the prices were so high that poor people were unable to buy food. Thus, a direct relation is found between poverty and incidence of famine. The causes of famines have been mainly attributed to the failure of monsoons and resulting in failure of crops. The main reason is that, in a country with tropical climate and most of its cultivated area being subjected to artificial irrigation, rainfall plays an important role in determining crop yields and food supplies. During times of famine, food scarcity was overcome by imports and distribution of food through relief camps. According to Bhatia, the Bengal Famine -1943 was a tragedy of total unpreparedness. The Famine Enquiry Commission commented that there was a moral and social breakdown as well as administrative break down. Prior to the Bengal famine m 1943, during the Second World War, demand for food grains increased and thus pushing up prices. The government sought to balance the demand by encouraging shift in cropping pattern from non-foods crop to food crops. The higher requirement of food grains by the defense personnel increased the pressure on its supply as well as prices. The situation worsened following the Japanese occupation of Burma in 1942 (NCA, 1976). India had to depend on more imported food grains to meet its needs, after the separation of Burma in the mid-thirties, further increasing the pressure on the lower availability of food grains (Dasgupta, 1977).

Bhatia (1970) has analyzed India's food problem and related policies since independence. With the scenario of famines and shortages in food grains, Bhatia has analyzed the food situation in India keeping the change in demand due to increase in population and incomes in view. Policies related to imports and PL-480 Agreement and its impact have been discussed in the study. Relating food demand with population growth, Bhatia concludes that population growth was responsible for 60 per cent of the increase in total demand for food. He is of the opinion that the food problem in India was more due to lack of economic development than population explosion .During the plan periods, the growth rate in production was less than the growth rate in demand for food. In the initial periods of independence, there was a short fall in production of food grains. The supply was restored through Grow More Food Campaign (GMFC). The GMFC was a beginning of a sustained national effort at improving agricultural production and agricultural development in general. There were no targets set for food production during the early phase of the GMFC. However, increase in food grain production was brought about through reduction in area under cotton and increase in area under minor irrigation (NCA, 1976). In the efforts made by the government to increase food grain production, Rs.675 million was spent on GMFC. In return, an additional 3.4 million tons of

food grains were achieved compared to the target of 4.5 million tones. However, the GMFC covered only four percent of total area under cultivation (Dasgupta, 1977)

A. *Food Security Situation in India*

The Food Insecurity Atlas of India prepared by the UN World Food Program and M. S. Swaminathan Research Foundation on the basis of a food insecurity index shows that Bihar and Jharkhand are two "extremely food insecure" states in India (as cited in De Vries et al. 2002, figure 5, p 21). The poor agricultural productivity and production, and low level of food grain outputs resulting from the low level introduction of agricultural/crop technologies; poor rural infrastructure; high vulnerability of crop production to natural disasters such as floods and droughts; and high rates of unemployment and poverty, are some of the reasons for the high degree of food insecurity. For instance, the annual growth rate of per capita Gross State Domestic Product (GSDP) is the lowest (1.2 % during 1991-92 to 1997-98) in Bihar among all Indian states, against 7.57 percent in Gujarat. It is 1.24 percent in UP and 1.64 percent in Orissa (SDP and population data obtained from the Central Statistical Organisation as quoted in Ahluwalia 2000). Similarly, the poverty ratio is the highest (54.96 %) in Bihar, and the second highest of 24.21 percent is in Gujarat (Planning Commission as quoted in Ahluwalia 2000).

On the other hand, Gujarat, according to the Atlas, is "severely food insecure". Serious groundwater depletion, land degradation and the high degree of vulnerability of most parts of the State to droughts, the increasing allocation of scarce water from rural areas for industrial production and municipal uses are important factors causing agricultural output losses, and food insecurity problems in the State. In fact, groundwater depletion has increased the vulnerability to droughts of the most parts of the State, which do not have access to water supplies from surface sources and subjected to highly variable rainfall conditions (Kumar 2002b). This is in spite of the high rate of economic growth achieved mainly through rapid industrialization (8.87 % annual growth) and the low percentage of people living below the poverty line. It is also important to note that the State recorded a very low growth rate in the agricultural sector, with the agricultural component of GDP growing at a slow rate of 1.42 percent during 1980-81 to 199798 (EPW Research Foundation, as quoted in Hirway and Mahadevia 1999). This once again reinforces the fact that unless we maintain steady growth in agricultural sector and food grain production, it is difficult to achieve food security, even with high levels of GDP growth and high average per capita incomes. According to the Atlas, Madhya Pradesh, Rajasthan, Uttar Pradesh, Chhattisgarh, Orissa and Uttaranchal are also "severely food insecure" states. At the same time, states such as Andhra Pradesh, Maharashtra, Karnataka and West Bengal are "moderately food insecure"; Kerala and Tamil Nadu are "moderately food secure"; and Punjab and Himachal Pradesh are "food secure" (De Vries 2002: figure 5, p. 21).

B. *Agricultural sustainability: A Conceptual Frame work*

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.

India can safely be characterized as an agricultural country despite the recent spurt in manufacturing and services and the declining share of agriculture in the national income, since majority of its workforce (~ 65%) are still engaged in agriculture and allied activities. It has been the noblest profession in India since the time immemorial and has been carried out on sustainable basis. It is only relatively recent phenomenon that large-scale forest areas, grazing lands and waste lands have been converted into croplands to support the rising population, which has caused ecological imbalance and atmospheric pollution. With no further scope for expansion of agricultural land efforts have been made to enhance the production of food grains using high-yielding variety of seeds, fertilizers and irrigation along with advanced farm equipment's. However, so-called green revolution is confined to a few crops, viz, wheat, rice and maize and has been possible only in restricted areas, i.e., Punjab, Haryana and Western Uttar Pradesh and certain selected districts of Andhra Pradesh, Maharashtra and Tamilnadu.

Naturally much work is needed to lift the agriculture to a level where it is least affected by vagaries of monsoon and needs little from outside the farm, i.e., lesser dependence on chemical fertilizers and water. The limited success of green revolution has been a mixed bag in that it has given rise to new set of problems: overuse of water and fertilizers. Excessive use of water results in water logging and salinization whereas excess of fertilizers and pesticide cause pollution of water bodies contamination of ground water. India has the largest area of irrigated land (55 million hectares) of which about one-third land is already degraded and 7 million hectare have been abandoned1. In such a situation a renewable and lasting alternative, sustainable agriculture, has to emerge for successful agricultural revolution. In the present paper the need for sustainable agriculture has been emphasized. Policies for

sustainable agriculture and organic farming and possible actions in India are discussed. The sustainable agriculture may be defined as any set of agronomic practices that are economically viable, environmentally safe, and socially acceptable. If a cropping system requires large inputs of fertilizer that leak from the system to pollute ground water, drinking supplies and distant coastal fisheries, the system may be sustainable economically as the long-term supply of fertilizer is stable and the economic cost of fertilizer is easily borne by larger grain production but it is not sustainable environmentally or socially, since it does not cover the cost of environmental damage or social costs. The organic agriculture focuses on "living soil", on optimizing the use of biological processes and on avoiding the use of synthetic chemicals and fertilizers. Advocates of sustainable agriculture agree with biological focus and hope to reduce but not necessarily eliminate chemical use. In the context of sustainable agriculture another term "alternative agriculture" has been prominently used. Definition of alternative agriculture sheds much light on operational aspects of sustainable agriculture. Any food or fiber production that has

- A more thorough incorporation of natural processes,
- Reduced use of off-farm inputs with less harm to environment and consumers,
- A more productive use of biological and genetic potential of plants and animals,
- A better match between cropping patterns and the physical capacity of lands and,
- An improved emphasis on conservation of soil, water, energy and biological resources, is defined as alternative agriculture.

The normal agricultural practices using irrigation, chemical fertilizer, pesticides and high-yielding variety of seeds is called conventional agriculture. With increasing use of chemical fertilizers and pesticides the conventional agriculture is major source of pollution of inland water bodies and coastal seas. There has been growing criticism of conventional agriculture for its side effects, the "external costs" which impact communities, the environment, and human health. As for indicators of sustainability there is no single prescription. Sustainable practices will vary by cropping system, local environment and socio-economic system. Still, experience tells us that locally sustainable systems tend to be more resource conservative than less sustainable system and tend to rely less on external inputs and more on internal ecosystem services.

C. Status of Food and Nutritional Security

Improved high-yielding varieties of seeds, subsidized inputs, infrastructural developments, increased research and extension efforts, favorable agricultural price regimes accompanied by active government intervention in the food grain market and well-co-ordinate government programmers with able leadership ushered in Green Revolution in India during the 1960s. Adoption of these agricultural technologies and supporting price policies together helped in accelerating the production of food grains (especially of rice and wheat) in the country, enabling a hike in the per capita availability of food commodities (except pulses). Increase in the domestic production eliminated dependence on food import and India turned out to be a net exporter of food grains (Joshi et al., 2009). However, in spite of impressive agricultural growth, the per capita availability of food grains hovered around 200 kg per annum between year 1983-84 and year 2009-10 and the availability of cereals has been around 185 kg per annum (Table 1). The increase in production has been much higher for horticultural, fish and livestock products than food grains. The per capita availability of non-food grains food commodities witnessed a considerable increase which helped in catering to the diversified food needs of the households. Despite much higher and much impressive growth in non-food grains food commodities, the popular opinion in the country appreciates green revolution only for its success in terms of increased food production. The remarkable achievement in the production of non-food grains food commodities such as fruit and vegetables, milk, eggs and fish needs adequate attention in the policy discourse.

The trends shown in Table-1, suggest that India has not only achieved self-reliance in food grains production but often it is faced with the challenge of management of huge food grain surplus that accumulates as public buffer stocks.

D. Why Sustainable Agriculture????

We can compare three broad types of farming: traditional production systems, conventional modern agriculture (such as Green Revolution technologies), and sustainable agriculture. We can compare them across three dimensions: ecological, economic and social.

E. Ecological Sustainability

Many traditional and most conventional farm practices are not ecologically sustainable: they overuse natural resources, reducing soil fertility, causing soil erosion, and contributing to

TABLE I
PER CAPITA PRODUCTION OR AVAILABILITY OF DIFFERENT FOOD COMMODITIES IN INDIA: 1983-84 TO 2009-10 (IN KGS/ANNUM)

Year (1)	Food grains (2)	Cereals (3)	Pulses (4)	Vegetables (5)	Fruits (6)	Milk (7)	Eggs (8)	Fish (9)
1983-84	198	181	17	56	31	52	17	31
1993-94	206	191	15	68	33	67	27	55
2004-05	184	172	12	86	45	84	39	59
2009-10	198	185	13	113	60	94	49	62

Source: Agricultural Statistics at a Glance (various years)

global climatic change. Sustainable agriculture has several major advantages over both traditional and conventional practices

F. Soil Fertility

A continuous fall in soil fertility is a major problem in many parts of India. Sustainable agriculture improves fertility and soil structure and prevents erosion, so would be an answer to this problem.

G. Water

Irrigation is the biggest consumer of fresh water, and fertilizer and pesticides contaminate both surface- and groundwater. Sustainable agriculture increases the organic matter content of the topsoil, so raising its ability to retain and store water that falls as rain.

H. Biodiversity

Sustainable agricultural practices frequently involve mixed cropping, so increasing the diversity of crops produced and raising the diversity of insects and other animals and plants in and around fields.

I. Pollution

Pesticides are hazardous to human health as well as to the local ecology. Incorrect handling, storage and use of pesticides lead to health and pollution problems. Sustainable agriculture reduces or eliminates the use of hazardous chemicals; instead it controls pests with a variety of biological and agronomic measures and the use of natural substances.

J. Landscape

Agriculture and forestry cloth the rural landscape. Inappropriate use causes erosion, landslides and flooding, clogs irrigation channels, and reduces the ability of the land to support the local population. Impoverished rural people flock into the cities in search of jobs, forming unsightly, insanitary slums that further destroy the landscape. Rehabilitating ecologically damaged areas needs huge investments that few countries can afford. Sustainable agriculture avoids these problems by improving productivity, conserving the soil, avoiding the expansion of farming into unsuitable areas, and preserving rural jobs.

K. Climate

The way agriculture is practiced contributes significantly to global climatic changes. Conventional agriculture contributes to the production of greenhouse gases in various ways: by reducing the amount of carbon stored in the soil and in vegetation, through the production of methane in irrigated fields, and through energy-intensive activities such as the production of artificial fertilizers. Adopting sustainable agriculture would reduce these impacts significantly.

L. Economic Sustainability

Agriculture cannot be sustainable unless it is economically viable over the long term. Conventional agriculture poses greater long-term economic risks than "sustainable" alternatives.

M. Export vs. Local Orientation

Governments tend to view export-oriented production systems as more important than those that supply domestic demands. This is misguided. Focusing on exports alone involves hidden costs: in transport, in assuring local food security, etc. Policies should treat domestic demand and in particular food security (either by farmers producing food for themselves, or by selling produce for cash they can use to buy food) as equally important to the visible trade balance.

N. Debt

The Green Revolution raised India's grain output significantly, but a vast number of small-scale farmers ran into a debt trap they took out loans to raise their production, and then found they could not pay the money back. About 40,000 were so desperate that they committed suicide.

O. Risk

Concentrating on specific commodities seems to promise high economic returns. But market production implies certain risks: markets change quickly, and international agricultural prices are dropping. Cheap foreign food may sweep into the national market, leaving Indian farmers without a market. As a World Trade Organization signatory, the Indian government is under pressure to deregulate and open its economy to the world market so cannot protect its farmers behind tariff walls.

P. Niche Markets

Organic agriculture is one of the strongest ways to farm in an environmentally sustainable way. The demand for certified organic products is increasing quickly, opening opportunities to expand sales of such products and to explore niche markets.

Q. Employment

Farming is the main source of employment for rural people. Trends towards specialization and mechanization may increase narrowly measured "efficiency", but they reduce employment on the land. The welfare costs of unemployment must be taken into account when designing national agricultural support programmers. Sustainable agriculture, with its emphasis on small-scale, labor-intensive activities, helps overcome these problems.

R. Social Sustainability

The social sustainability of farming techniques is related to the ideas of social acceptability and justice.

S. Inclusiveness

Development cannot be sustainable unless it reduces poverty for the broad masses of people in India. The government must find ways to enable the rural poor to benefit from agricultural development.

T. Political unrest:

Gaps between the "haves" and "have-nots" feed a feeling of social injustice among those who feel neglected and excluded from development opportunities, as well as from better-off sympathizers. The result is a climate favorable to political opposition and even violence.

U. Local Acceptance

Many new technologies fail because they are based on practices or assumptions from outside. Sustainable agricultural practices usually are based on local social customs, traditions, norms and taboos, so local people are more likely to accept them and adapt them to their own needs.

V. Indigenous knowledge

Sustainable agricultural practices often rely on traditional knowhow and local innovation. Local people have a wealth of knowledge about their environment, crops and livestock. They keep locally adapted breeds and crop varieties. They have social structures that manage and conserve common resources, help people in need, and maintain the social fabric. Rather than ignoring or replacing this knowledge, sustainable agricultural development seeks to build on it and enrich it with appropriate information from outside.

W. Gender

In traditional agriculture, women traditionally bear the heaviest burdens in terms of labor. In modern conventional farming, too, men often benefit the most: they control what is grown and how the resulting income is spent. Sustainable agriculture attempts to ensure that the burdens and benefits are shared more equitably between men and women.

X. Food security

Traditional farming techniques often fail to produce enough food, or enough variety of food for a balanced diet. Conventional modern farming focuses on a few commodities, so people still do not have a balanced diet. Sustainable agriculture improves food security by improving the quality and nutritional value of the food, and by producing a bigger range of produce throughout the year.

Y. Participation

Traditional society in India is raven by wealth and caste distinctions. Introducing conventional farming innovations tends to exacerbate these: the rich and higher-caste tend to benefit, while the poor and lower-caste are left out. Sustainable agricultural interventions consciously target the less well-off, and empower them so they can organize and speak with their own "voice", so promoting dialogue and democracy.

Z. 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. These slowdowns have worsened since 2000, both overall agricultural production and food grains production have shown negative growth rates in 2000-01 to 2002-03 period. 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 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.

AA. Policy implications towards Sustainable Agriculture – Possible measures in India

- Improvement of existing production systems (e.g. altered crop rotations, introduction of green manuring, use of plant species adapted to specific locations)
- Improved protection of natural resources (e.g. erosion protection)
- Increase in efficiency of existing resources (e.g. irrigation, use of technology, basic and advanced training)
- Introduction of regenerative branches of business (e.g. horticulture or aquaculture)
- Introduction of a new production element in existing enterprises (such as fruit trees to stabilize terraced fields, fish-farming in rice fields)
- Optimization of post-harvest systems (e.g. storage)
- Increase the value of agricultural products through further processing (e.g. production of yoghurt from milk)
- Improvement of channels of distribution (e.g. market access, transport)
- Access to loans and other financial services
- Covering risk (e.g. through land law, support of producer groups)

IV. Conclusion

Under the changing agricultural scenario, the agricultural technologies needs a shift from production oriented to profit oriented sustainable farming. In this direction, the pace of adoption of resource conserving technologies (RCTs) by the Indian farmers is satisfactory to a larger extent but, under the present scenario, we are in the half way of Conservation Agriculture (CA). The CA systems will leads to sustainable farming and will be the most thrust of the future farming. The conditions for development of sustainable agriculture are becoming more and more favorable. New opportunities are opening the eyes of farmers, development workers, researchers and policy makers. They now see the potential and importance of these practices not only for their direct economic interest but also as the basis of further intensification and ecological sustainability. This does not mean that agrochemicals can be

abandoned. Also, research has an important role to play. Bankers and funders should think of how best to provide incentives and credits, accessible to poor farmers and women, to make investment in dry land farming possible. As conditions for farming will continue to change, the key to sustainable agriculture is the capacity of farmers and all other actors in agricultural development, as well as the wider society, to learn, experiment, adapt and cooperate in an effective way. To conclude, a small farm management to improve productivity, profitability and sustainability of the farming system will go a long way to ensure the all-round sustainability along with food security.

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