Chapter 8

Framing Food Security and Poverty Alleviation

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Abstract This chapter addresses current problems of food security, which is considered as one of the most important factors in development strategies to alleviate poverty, by examining relevant policies on agriculture and by discussing different ways to frame food security strategies. The commonly applied framing of development strategies—including strategies for food security—has been the enhancement of market function, even though actual approaches have been changing with the

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recognition of unexpected results such as environmental degradation and nutrition problems. Implementation of these policies has caused a decoupling of production and consumption. As a result, agricultural policies that represent the production or supply side have been implemented apart from nutrition policies, which are relevant to the consumption or demand side. In other words, because agricultural policies and nutrition policies have their own framings and because these framings are not integrated, many problems have occurred. It must be considered how decoupled production or supply can be combined with consumption or demand. In this connection, people's understanding of value that should reflect the shadow price must be transformed. Psychological strategies of providing proper information must be implemented with the SDGs, which are assumed to combine selected aims and targets based on particular contexts by stakeholders such as national governments, local municipalities, private companies, and international organizations.

Keywords Poverty · Food security · Market function · Decoupled production and consumption · Development strategies

8.1 Introduction

This chapter addresses current problems of food security, which is considered as one of the most important factors in development strategies to alleviate poverty, by examining relevant policies on agriculture and by discussing different ways to frame food security strategies. The purpose of development strategies for food security has been primarily to enhance market function. Although, as discussed later, new development strategies have been proposed and implemented after recognizing various newly arising issues to be considered, the above purpose has been essentially unchanged. In other words, the basic framing has remained the same. Development strategies should be supported by corresponding economic theories, which should have been also evolved so that they may support enhancing the market function. The transition of development strategies for food security and poverty alleviation are discussed hereafter along with the supporting economic theories.

Poverty alleviation has been put on the main development agenda at both the national and international levels. As indicated in a series of studies by Amartya Kumar Sen (Sen 1981; Drèze and Sen 1989; Sen 1999), the poverty issue must be investigated from the viewpoints of various dimensions including the amount of goods, services, and income as well as the freedom of utilizing them, people's behavior, and the state of human life. Thus, the framing for poverty alleviation must reflect these various dimensions. The most famous definition of sustainable development was provided in *Our Common Future* by the Brundtland Commission (UN 1987) as follows: *development that meets the needs of the present without compromising the ability of future generations to meet their own needs*. This definition strongly implies the importance of the ethical dimension. The Sustainable Development Goals (SDGs) were announced on January 1, 2016, with 17 aims and

169 targets based on the achievements of the Millennium Development Goals (MDGs) (UN Sustainable Development website and UN 2015). SDGs are the latest and the most comprehensive summary of development strategies. Now, because the SDGs are available as a common action guideline, everyone is encouraged to design strategies in line with the concepts of the SDGs. Development strategies must be designed not only to enhance market functions, but also enhance many other dimensions as described above.

In any overview of development strategies prior to the agreement upon the MDGs in 2000, *structuralism* or structuralist economics (from the 1940s to 1960s) must have been mentioned first (e.g., Singer 1950; Prebisch 1959; Nurkse 1952, 1953). Its fundamental concept was that market functions, including the price mechanism, had not worked in developing countries. Therefore, they insisted that governments had to play an active role to make a “Big Push” for economic development (Rosenstein-Rodan 1943, 1961, 1984). A subsequent approach that relied on neo-classical economics emerged as the mainstream theory of development strategies. The core concept of the *neoclassical approach* was that market functions had worked in both developed countries and developing countries, and that intervention in markets must be strictly limited to occurrences of market failure (e.g., Schultz 1961; Lal 1983; Balassa 1989).

In the 1980s, development strategies aimed to enhance market functions based on the neo-classical economics. Structural adjustment loans (SALs) by the International Monetary Fund and the World Bank (e.g., Hellenier 1987; Williamson 1983; World Bank 1990) are one of the most representative strategies. These development strategies were mainly composed of macro-economic policies. They were encountered by the Basic Needs approach of reformism which centered around the International Labour Organization (ILO), and also by the concept of “adjustment with a human face” by the United Nations International Children’s Emergency Fund (UNICEF), which insisted on the importance of viewing poverty at the household or individual level (Oman and Wignaraja 1991, ILO 1976, Hunt 1989; Cornia et al. 1987). In addition, at the beginning of the 1990s, different types of market failures were recognized: (1) poverty; (2) environmental degradation; (3) unequal distribution of resources such as income, property, and food; (4) problems associated with women and children; and (5) infectious diseases such as HIV.

Both formal and informal institutions have played essential roles in responding to these issues. However, development strategies fundamentally remained with the market function approach via neo-classical economic theory, or to some extent a new institutional economy in line with neo-classical economic theory. The core concept of the theory is the way to achieve Pareto Optimum, which is the criterion for the most efficient resource allocation. Because of the two fundamental theorems of welfare economics, Pareto Optimum can be attained under competitive equilibrium and all possible Pareto Optima can be equal to competitive equilibrium through proper wealth redistribution (Arrow 1951; Debreu 1954, 1959; Mas-Colell et al. 1995). In other words, the market mechanism is theoretically guaranteed to play a critical role in achieving efficient resource use and equal allocation of the resource. Achieving perfect market is the pre-condition of the fundamental theorems of wel-

fare economics. Therefore, neo-classical economics was considered to provide the proper rationale to the thought that enhancing market economy can contribute to poverty alleviation, even though the multiple dimensions of poverty were considered important. The approach from the neo-classical economics can be recognized as a framing of development strategy.

In addition to the economic bases as described above, food security has been a central issue in development strategy for poverty alleviation. Many reasons exist for this: (1) the threat of Malthus's world is becoming more of a reality, (2) many people are suffering from poverty in the rural areas of developing countries, (3) agriculture is the main industry in developing countries, (4) the number of undernourished people had remained virtually the same for several decades, and so on. Although the reasons for focusing on food security have changed over time, their fundamental policy has been the same: increasing agricultural productivity in a consistent manner. This policy has remained consistent, even though development strategies have evolved because of recognition of various negative factors such as environmental impacts (IAASTD 2008). Agricultural policies to alleviate poverty from the perspective of food security have been coordinated with economic policies in development strategies. This means that agricultural policy is oriented toward enhancing market function (World Bank 2008).

Enhancing market function decouples production and consumption. When the market function is enhanced, trading is expanded from the household level to local, national, or international levels. People have more potential opportunities to increase their production. Therefore, agricultural policies have primarily focused on the production or supply side. On the other hand, consumption is more related to nutrition policy. This decoupling of consumption from production often leads to not only the market failure but also mal-nutrition, and thus causes failure in poverty alleviation policies by the government. Agricultural policy dealing with production and nutrition policy dealing with consumption have different framings. Both policies are implemented separately and not integrated with each other because of decoupling consumption from production that results from development strategies.

In the following sections, we first give an overview of the impacts of the Green Revolution on poverty alleviation in developing countries. The Green Revolution began in the 1940s, and the development strategies associated with the Green Revolution were to enhance market function in agriculture. It impacted food security in the world tremendously through the decoupling of consumption from production. Second, we review how nutrition status was considered in development strategies. The impacts of the Green Revolution are discussed from the viewpoint of the production or supply side perspective. Nutrition status, however, is discussed from the viewpoint of consumption or demand side perspective. Third, we discuss the reasons for the failure of the market economy concept in neo-classical economic theory, as well as its implications. A summary of this chapter is provided at the end.

8.2 Impacts of the Green Revolution on Developing Countries

8.2.1 Brief History of the Green Revolution

The Green Revolution was named by William Gaud (1968), a former administrator of the United States Agency for International Development (USAID). It was a process of increasing the yields of cereals, wheat, and rice by developing a high yield variety (HYV) or modern variety (MV) with modern inputs such as modern irrigation systems, chemical fertilizers, and pesticides. It appeared in 1940s, and proceeded from the 1960s to the late 1980s or early 1990s. Developments of HYV of wheat and rice marked the beginning of the Green Revolution. In the early 1940s, the whole world stood in awe of reality of the threat of Malthus's world. In 1798, Thomas Robert Malthus published a famous book, *An Essay on the Principle of Population*, and insisted in the book that human population increased in a geometric or exponential manner, whereas the ability to produce food increased only in an arithmetic manner. In other words, the population would outgrow the ability of the land to produce food. Food shortages would have been real.

Agronomist Dr. Norman Earnest Borlaug, the recipient of the Nobel Peace Prize in 1970 and often known as the "Father of the Green Revolution," succeeded in developing HYV wheat at an institution in Mexico in 1943 under a variety improvement operation by the Rockefeller foundation, which had taken the initiative to counter potential food shortages. In the Mexican institute, the HYV wheat was developed by crossing Norin 10 from Japan onto an indigenous variety of spring wheat in Mexico. The developed HYV wheat variety was defused to Asian countries. To bring varieties from other areas, adaptation to differences in natural conditions was required. In the process of its diffusion among Asian countries, it was crossed onto area varieties through collaboration with National Agricultural Research Systems (NARS).

Agricultural research and development (R&D) systems, including NARS, were established through the process. The institute in Mexico became the International Maize and Wheat Improvement Center, CIMMYT (Centro Internacional de Mejoramiento de Maíz y Trigo), which is an institution under CGIAR (Consultative Group on International Agricultural Research). In the case of the other main cereal *rice*, HYV rice was developed in an institute in the Philippines, which became an institute under CGIAR, IRRI (International Rice Research Institute) supported by the Ford Foundation after the Rockefeller Foundation. One of the representative types of HYV rice was IR8, which was developed in 1966. It was produced by crossing semi-dwarf rice varieties from Taiwan onto a rice variety from Indonesia in order to respond to chemical fertilizer and increase productivity.

Figure 8.1 indicates yield trends by region and compares yield increase between Asia and Africa. In the 1960s, yields of cereal were virtually the same in South Asia and Sub-Saharan Africa. However, the difference has expanded since the 1980s, which came after the Green Revolution. In addition, when comparing the relationship

Fig. 8.1 Regional yield growth. (a) Trend of yield growth (Source: World Bank (2008)). (b) Yield growth in Asia and Africa (Source: FAO 2006)

between yield increase and area expansion of farm land, the increase in yield in sub-Saharan Africa has been stagnant in spite of the expansion of farm land while Asia increased cereal yield sharply without expanding farm land.

When Fig. 8.2 is examined again, it can be found that HYV and inputs other than farm area significantly contributed to the increase in cereal yield in Asia. Agricultural lands, including both croplands and pastures, occupy approximately 38% of Earth's terrestrial surface; it is the largest land use on the planet (Foley et al. 2011). The expansion of agricultural land is often preceded by deforestation (Lambin and Meyfroidt 2011), which has greatly influenced various environmental issues such as increase in greenhouse gas emissions, destruction of biological habitats, and decline in ecosystem services (Bommarco et al. 2013). In addition, because of restrictions on the expansion of agricultural land use, it has been intensified through the introduction of chemical fertilizers and pesticides, and through an increase in irrigation capacity to increase yield.

Agricultural land intensification impacts climate to a similar extent as land use changes (Luyssaert et al. 2014) and results in changes to local, regional and global biogeochemical and water cycles. It likewise has had major influence on biodiversity loss (Erb et al. 2013). Because choice of agricultural land management method greatly impacts the environment, interest in sustainable intensification has been increasing (Garnett et al. 2013; Tilman et al. 2011). Other inputs can be considered so-called modern inputs such as modern irrigation systems, chemical fertilizers, and pesticides. Though there are many reasons for the different results of various industrial policies, the differences observed between countries in Asia and in Sub-Saharan

Fig. 8.2 Decompose of factors for yield growth. **(a)** Early Green Revolution Period, 1961–1980. **(b)** Late Green Revolution Period, 1981–2000. (Source: Made by author from Evenson and Gollin (2003))

Africa are not discussed in detail because such discussion goes beyond the main purpose of this chapter. However, let it suffice to say that the chemical industry could be fostered in Asia to provide rather cheap chemical fertilizer. The Green Revolution can be considered as a process to make sufficient preparation to enhance market mechanism in agriculture. Details of the process have been discussed from the perspective of the meaning of the Green Revolution in the context of development strategy in the next section.

8.2.2 The Meaning of the Green Revolution in the Context of Development Strategy

The Green Revolution introduced the opportunity of applying the accumulated knowledge of science to agriculture. The Green Revolution preceded the development of HYV by purposefully breeding to enhance its yield with chemical fertilizers. Narrowing the gap between production in the actual field and the experiment field was made possible by the development of HYV, and by the accumulation of scientific knowledge such as the utilization of modern irrigation systems and the appropriate use of chemical fertilizers and pesticides. In another perspective, private sector actors (such as the chemical industry and the medical industry), who can use their accumulated knowledge and skill to produce pesticides, were able to take part in the agricultural industry after the Green Revolution. Market economics intruded into the agricultural industry after the Green Revolution. International organizations such as FAO supported this change by expanding international seed operations, i.e., International Seed Campaign (1957–1962), World Seed Year (1961), Improved Seed Development Plan (1973), among others.

Importantly, multinational companies entered the market. Multinational chemical companies and medical companies entered the seed industry. Multinational agribusiness companies together with food distribution and food processing companies also entered the seed industry. In addition, advances in breeding technology caused increased R&D investment and an increasing gap between large and small seed companies. Then, aggravation of M&A in the seed industry was caused by multinational companies who concentrated on a very small number of companies to address seed development and production in order to lower their risk. The multinational companies bought up existing seed companies rather than starting their own seed operations as newcomers, which would have required them to obtain genetic resources and acquire their own breeding technology to compete with other competitors in the market. In any case, the market economy penetrated and expanded into agriculture after the Green Revolution as a development strategy to alleviate poverty.

However, the Green Revolution also caused several problems of market or government failure, as did other aforementioned development strategies. High intensive input farming, which is one of features of the Green Revolution, typically involves

monocrop fields and a package of modern seed varieties, fertilizers, and pesticides. It causes various problems such as water pollution, indirect damage to larger ecosystems, and inadvertent pesticide poisoning of humans, animals, and non-targeted plants and insects caused by mismanagement of irrigation water, injudicious use of fertilizers and pesticides, and excess chemical fertilizer use (World Bank 2008). Figure 8.3 indicates the growth of concern in agriculture.

With the various problems caused by the Green Revolution, as with other development strategies to alleviate poverty, unexpected and new issues have arisen and been recognized over time. In other words, these issues were from that framing in the beginning had been not enough. One of the important features of the market function under neo-classical economic theory detaches demand or consumption from supply or production. This can also be found in agriculture after the Green Revolution. Although problems caused after the Green Revolution are commonly recognized, those are only perspectives from supply or production.. The framing of development strategies in food security from the production perspective has changed to recognize unexpected impacts such as environmental degradation, although the framing of poverty alleviation, which is a general development strategy to enhance market function in food security, remained. To understand the features and results of development strategy framing, particularly enhancing food security to alleviate poverty, those perspectives are still insufficient. Although if all the market failures in production or supply side have been confronted properly, such efforts would still be insufficient to alleviate poverty. Another framing is needed for poverty alleviation in terms of food security. Demand side must be considered. The impact of enhancing market function in demand or consumption of agricultural production

Fig. 8.3 Pathway to the current conception of modern agriculture. (Source: IAASTD (2008))

after the Green Revolution—in short, nutrition status—is discussed in next section.

8.3 Poverty Alleviation from a Nutrition Perspective

8.3.1 *Development Strategies for Nutrition*

Framing food security from the perspective of demand has changed with the recognition that previously implemented strategies failed and led to unexpected results, as is the case with the production perspective. In this section, transition of development strategies from a nutrition perspective is overviewed first.

The MDGs made poverty and hunger alleviation as their first target, aiming “to halve between 1990 and 2015 the proportion of people who suffer from hunger” (UN Millennium Project 2005). Global food production was more than enough to feed the global population, however 14% of the world population, including children, was undernourished in 2007 (FAO 2008). Nearly nine million children under the age of five died in 2007, and over one-third of those deaths were linked to under-nutrition (FAO 2008). Consequently, it became recognized that alleviation of child undernutrition was the most unattainable goal among the MDGs because of the insufficient effort of the countries involved and the international community.

Under such a situation, the Lancet series on maternal and child undernutrition was launched in 2008, pointing out the urgent need to scale up the international nutrition governance system (Horton et al. 2008). The series also highlighted the short-term and long-term consequences of child undernutrition: child undernutrition affects not only disability, morbidity, and mortality during his/her childhood stage but also affects body size, intellectual ability, economic productivity, reproductive performance, and cardiovascular disease risk during his/her adulthood stage (Black et al. 2008). The final paper of this series stated that ‘the international nutrition system comprised of international and donor organizations, academia, civil society, and the private sector—is fragmented and dysfunctional’ (Morris et al. 2008). Provoked by this series, political commitment to child malnutrition increased (Table 8.1).

In 2010, Scaling Up Nutrition (SUN) was established to tackle stunting (low height-for-age, indicating chronic restriction of a child’s potential growth) with a special focus on the 1000-day window of opportunity, from conception to a child’s second birthday. The SUN movement currently has 54 member countries (Menon et al. 2014). In 2012, WHO issued a resolution at the 65th World Health Assembly endorsing a comprehensive implementation plan on maternal, infant, and young child nutrition that specified a set of six global nutrition targets by 2025. Importantly, one of those six targets was ‘to ensure that there is no increase in childhood overweight’, which was the first attempt to regard ‘overnutrition’ as an increasing form of malnutrition (WHO 2012). In 2013, first Nutrition for Growth (N4G) summit was

Table 8.1 Global movement on nutrition issues

Jan 2008	1st series of maternal and child undernutrition in Lancet	Highlight the importance of first 1000 days for tackling malnutrition.
Sep 2010	Scaling Up Nutrition (SUN) initiated	
May 2012	65th World Health Assembly was held. ‘comprehensive implementation plan on maternal, infant and young child nutrition’ was adopted.	Global Nutrition Targets 2025 was decided.
June 2013	First Nutrition for Growth (N4G) summit was held.	
Aug 2013	2nd series of maternal and child undernutrition in lancet	
Nov 2014	FAO and WHO jointly organized Second International Conference on Nutrition	Focused on targeting all forms of malnutrition.
Sep 2015	SDGs	12 out of 17 targets included nutrition related issues

hosted by the governments of Brazil and the UK, yielding over 200 commitments to expand the reach of nutrition interventions during the 1000-day window, reducing stunting, and saving the lives of almost two million children under the age of five. Two months after the first N4G, the second Lancet series on maternal and child nutrition was published; in this series, the title was changed from ‘undernutrition’ to ‘overnutrition’, highlighting the increasing awareness of dual forms of malnutrition (Black et al. 2013).

In 2014, FAO and WHO jointly organized the second International Conference on Nutrition, which had a strong focus on tackling all forms of malnutrition including undernutrition, micronutrient deficiencies, and overnutrition with a view to achieving global nutrition targets set by the World Health Assembly by 2025 (Haddad et al. 2015). To this end, unlike the MDGs framework, the 2013 High Level Panel on the Post 2015 Development Agenda explicitly recommends nutrition as an explicit feature of one of its proposed goals (Haddad et al. 2015). Consequently, in the Sustainable Development Goals (SDGs) launched in 2015, 12 out of 17 targets included nutrition-related issues (IFPRI 2016).

UNICEF framed the nutritional status of children as determined by a range of immediate, underlying, and basic causes (UNICEF 1990), and different approaches addressing different levels of those determinants have been taken to tackle child malnutrition problem. Nutrition-specific interventions address the immediate determinants (i.e., dietary intake and disease) through micronutrient supplementation and fortification, improvement of breastfeeding and complementary feeding, and strengthening hygiene. Most of the intervention programs have been in the form of a nutrition-specific approach, which is highly project- or donor-dependent and is difficult for the local community to sustain.

A nutrition-sensitive approach addresses underlying determinants (i.e., food security, health access, healthy household environment, and care practices) through improving agriculture, water and sanitation, education, and social protection (Black

et al. 2013). Global interest in this nutrition-sensitive approach, which might offer sustainable solutions for local population, is recently increasing. However, so far, the evidence base is weak on how to make interventions that address more nutrition-sensitive underlying determinants (Haddad et al. 2015). Masset et al., for example, systematically reviewed papers assessing the impact of agricultural intervention on improvements in child nutritional status and concluded that very little evidence was found for such intervention, because the prevalence of malnutrition was mostly caused by methodological weakness (2012).

The Global Nutrition Reports 2014 and 2015 provided some specific ideas for interventions on food systems and agriculture; however, evidence is limited to kitchen gardening and bio-fortification (IFPRI 2016). Furthermore, as mentioned earlier, global efforts to combat child malnutrition have until recently mainly targeted undernutrition. Many developing countries now, however, need to simultaneously solve dual forms of malnutrition such as undernutrition and overnutrition. Child overweight or obesity is rapidly increasing in those countries (Black et al. 2013). The basic driver of undernutrition is mostly limited food accessibility, availability, and affordability, whereas that of overnutrition is basically inappropriate dietary choices or behaviors.

Inappropriate dietary choices or behaviors relate to various socioeconomic factors such as subsistence patterns, local economy, food system, food environment, and health and nutrition education, which imply that multi-sectoral and transdisciplinary approaches are necessary to solve the problem. Solving the problem of undernutrition used to be the main target of development strategies in the context of food security. In terms of quantity of food, agriculture enhanced by development strategies after the Green Revolution contributed to food security. However, there have been many problems in terms of quality and nutrition intake. In addition, the unexpected issue of becoming overweight is now arising. At the same time, it has been recognized that dietary patterns impact environment, which is discussed in the next section.

8.3.2 *Environment and Nutrition*

In 2010, FAO proposed the concept of a ‘sustainable diet’ – a diet with low environmental impact that contributes to food and nutrition security and to a healthier life for present and future generations (FAO 2012). Since that time, the amount of literature assessing the environmental impact of dietary behavior has been increasing. The review work of Auestad and Fulgoni about ‘sustainable diet’ found 31 papers examining sustainable diet mostly published from 2010 to 2014. Those papers assessed different indicators of the environmental impacts of different diet patterns such as greenhouse gas (GHG) emissions, land capacity, energy/fossil fuel use, and water use (Auestad and Fulgoni 2015).

The health community also recognizes that environmental sustainability is increasing. WHO recently highlighted the importance of win-win approaches to

health and environment, especially those that reduce GHG emissions and increase resilience to environmental change. For example, reducing saturated fat intake from livestock products has co-benefits for health and environment: 8–9% of global GHG emissions come from the livestock sector, which provides large amounts of saturated fat leading to increased risk of cardiovascular diseases (Friel et al. 2009). WHO recommends high saturated-fat, high calorie-meats and processed foods be substituted with more unprocessed foods, fiber-rich foods, and fresh fruits and vegetables. The Global Nutrition Report also recommends increasing dietary diversity, especially increasing fruits and vegetables in the diet (IFPRI 2016). Many developing countries, however, are shifting from subsistence farming to industrialized food production, leading to the gradual loss of biodiversity in local food varieties of legumes, fruits, nuts, seeds, and berries, and to an increased reliance upon simplified diets of imported food varieties or mass-produced staples. This change has led to diets that are energy rich but contain few vital micronutrients. Thus, more effort is urgently needed to provide locally sustainable solutions to improve nutrition and agricultural systems.

In recent years, data show how changes in dietary habits strongly affect health and the environment (Aleksandrowicz et al. 2016; Springmann et al. 2016; Tilman and Clark 2014). Erb et al. (2016) have been studying the effects of dietary habits at a global level and have shown that it is possible to nurture a growing human population without deforestation by combining the transition to a vegetarian diet and sustainable intensification. These scenario-based studies provide insights into potential pathways for food systems change. These studies, however, do not tell much about what policies or interventions will help to realize the illustrated scenarios. Because most of the future population growth is expected to occur in cities, it will be necessary to prepare a nutritious and environmentally-friendly food environment in newly developed areas and to transform the food environments of existing urban areas.

Enhancing market function was the main development strategy to alleviate poverty. As a consequence, decoupling of consumption from production occurred, followed by unexpected market failure and government failure as explained in detail in the next section. These undesirable situations were caused by an improper framing, where production/supply and consumption/demand were separately handled in the policy application. Namely, the food supply (production) was governed by neo-classical economic theories without consideration of environmental factors; and the nutritious demand for food (consumption) did not properly consider people's diet patterns. In fact, people's psychological response for the applied strategies/policies, preference for food, perception and values about food, among others are essential factors when actual strategies/policies are designed and implemented. In the next section, theoretical framework of people's value in the supporting theory of development strategies is overviewed.

8.4 Dysfunction of Framing in Poverty Alleviation

8.4.1 *Market Failure and Shadow Prices*

The market failure was a consequence of dysfunction in the market economy framing for poverty alleviation, and caused by several factors including externalities, public goods, scale economy, asymmetric information, and uncertainties. As explained in the previous section, the Green Revolution unearthed various unexpected environmental degradation issues. The dissociation of actual prices and shadow prices is one reason for this. *Shadow price* refers to the true social value or cost of a resource. Neo-classical economic theory assumes that people decide their behavior based on a sense of value, which is reflected on the price in the market through subjectivity to maximize utility.

Prices must reflect the real value of goods including the impacts on the environment. If a price does not reflect the real value, the resource may not be used properly and environmental degradation will occur. People should be aware of the mechanism of shadow price so that they can behave and use resources properly. The difficulty of estimating the shadow price of natural resources is often highlighted, but one reason for unexpected environmental degradation is that people behave without understanding the proper shadow price of the resource. Furthermore, shadow price can change dynamically by transforming the resources' sense of value in the society. In the implementation process of development strategies to alleviate poverty, food consumption or nutrition intake was detached from agricultural production after the Green Revolution. The pursuit of increasing agricultural productivity led to monocrop agriculture, which means transition from subsistence farming to industrialized food production. Under such a situation, malnutrition still coexists with overnutrition at household, local, regional, national and global levels. Overnutrition results from improper dietary choice or behavior based on the value reflected by shadow prices. The value of a resource in a society is often formulated by insufficient knowledge or information, and people cannot behave properly with improper knowledge. In the next section, potential interventions are discussed.

8.4.2 *Social and Behavior Change*

Behavioral theories and models aim to extract psychological structures common to many behaviors, and to describe them as usually focusing on some specific core factors. However, human behaviors are often decided through many steps and various influential factors: intention, attitude, locus of control, self-efficacy, knowledge, opportunity, cultural habitats, social supports, among others. In addition, social determinants including knowledge, attitudes, social norms, and cultural practices from the individual level to the society level should affect the behaviors. Social and behavioral change communication (SBCC) programs have been well known as

powerful tools for fundamental understanding of human interaction (communication) that can strongly influence the social dimensions of health and well-being. According to SBCC, evidence-based communication programs can increase knowledge, shift attitudes and cultural norms, and produce changes in a wide variety of behaviors (Lamstein et al. 2014). Obtaining and providing scientific knowledge about these factors based on research is the first step of great importance, although some uncertainties about human behaviors always exist. Furthermore, SBCC emphasizes that communication goes beyond the delivery of a message, and encompasses the full range of ways in which people can individually—as well as collectively—identify the meanings of their behaviors, and raise the level of impacts on social and behavioral changes.

In a way, this type of change has a wider coverage than individual change. SBCC is the systematic application of interactive, theory-based, and research-driven communication processes that provides strategies for change at three levels: individual, community, and society. There are three main strategies of SBCC across these levels: (1) behavior change communication that applies multimedia and participatory approaches for change at the individual and community levels; (2) social and community mobilization that develop partnerships and alliances to influence the community level to the national level, and (3) advocacy that bridges different levels of approaches and their influences through political and social commitment. It is important to involve multiple stakeholders in a knowledge exchange and create platforms for that in order to design, implement and disseminate the scientific evidence. Multiple stakeholders broadly encompass local governments, local NPO/NGO, private sector, local residents, scientists, researchers, and mass media, including others who have been working on local issues.

Fujii et al. (2001) and Fujii (2016) proposed concepts of structural and psychological strategy for planning transportation systems, which implied many political issues. Structural strategy can be considered as a method for changing the social structure, which corresponds to enhancing market structure and reducing market and government failure. Psychological strategies influence psychological factors such as morale or recognition without changing the social structure. Providing proper information is part of this strategy. People's values define their behavior, and are reflected in shadow prices. However, formulated values are not always proper from various perspectives in development strategies and the value in itself must change as society changes. Thus, psychological strategy plays an important role alongside structural strategy, and the psychological approach can be applied to development strategies, including strategies relevant to food security.

8.5 Summary

Food security was, and still is, a main issue in development strategies to alleviate poverty. The commonly applied framing of development strategies—including strategies for food security—has been the enhancement of market function, even though

actual approaches have been changing with the recognition of unexpected results such as environmental degradation and nutrition problems. Agricultural policies that represent the production or supply side have been implemented apart from nutrition policies, which are relevant to the consumption or demand side. In other words, implementation of these policies has caused a decoupling of production and consumption. Because agricultural policies and nutrition policies have their own framings and because these framings are not integrated, many problems have occurred. Livelihoods used to rely on natural resources in the past, whereas consumption of food or nutrition intake is now detached from production or supply of food at household, regional, national, and international levels. People who used to live in self-sufficient economies now begin to purchase necessary goods and services with money they have earned by using their own resources including their own labor at the household level. At the same time, this transformation of the economy at the household level is enhanced through cross-regional and international trading.

Because of the multidimensional perspectives of poverty, enhancing market function as a general principle of development strategies—including strategies relevant to food security—appears a rational and palatable approach. Thus, structural strategies have been applied to reduce market failure and government failure. It must be considered how decoupled production or supply can be combined with consumption or demand. In this connection, people's understanding of value that should reflect the shadow price must be transformed. Psychological strategies of providing proper information must be implemented with the SDGs, which are assumed to combine selected aims and targets based on particular contexts by stakeholders such as national governments, local municipalities, private companies, and international organizations.

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