

Final Thesis

What is the role of agriculture for sustainable development?

Lessons from India

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## Executive Summary

Despite some remarkable achievements of international cooperation and national success stories of development, decades of development cooperation and nations' efforts have not resulted in the eradication of severe poverty for substantial parts of the world's population and the establishment of sustainable economic growth in the Global South. There is still no silver bullet for economic growth, let alone a recipe how to pave the way for sustainable development. Interestingly, even though agriculture played the dominant role in almost all traditional economies, most of the developing countries have neglected agriculture in development as a key sector for sustainable development.

Against this background the purpose of this final thesis is to explore the question of the role of agriculture for sustainable development based on a literature review and a case study on India. It brings together the latest research for the nexus of agriculture-related economic growth, environmental responsibility and social progress and provides lessons learnt from India's case for other emerging economies.

Literature shows agriculture has manifold impacts on sustainable development: Agriculture is providing livelihoods, is feeding the population and supplying raw materials for the other sectors, it can make labour and capital available for the other sectors, it is in itself a market with a big potential, it creates foreign exchange earnings, it determines largely about the health of the environment and people, and also strongly influences poverty rates and equality among people. Thus, the role of agriculture for development is doubtless a crucial one.

Looking at the history of development paradigms, agriculture got in and out of fashion as an important contributor for development. At first agriculture was regarded by development economists as an ancillary to industrialization only, concretely as a mere source of labour and transferable capital surplus. Much later, when in 2000 the Millennium Development Goals were introduced, it was agreed to have pro-poor economic growth – and which sector was better suited for this than agriculture which was and still is occupying most of the poorest of the poor? Since the World Development Report 2008, famously titled “Agriculture for Development”, agriculture was again in the spotlight for the global challenge to combat poverty and facilitate economic growth. The already presumed dead sector has shown to be too important to ignore.

And indeed, the literature shows that agriculture-led growth can be a valuable strategy for development. However, this is not universally applicable because it is largely context-specific, and a certain set of conditions should be fulfilled, e.g. agriculture must account for a large share of employed people. Thus there is no one-fits-all solution for the contribution of agriculture to economic growth. But sure is – since the agriculture sector involves a high proportion of the poor – it has a huge potential to reduce poverty with pro-poor growth on a large scale. According to the World Bank the agriculture sector is two to four times more effective in raising incomes among the poorest compared to other sectors. However, it is still debated in the scientific community whether agricultural development can be an effective engine of growth and whether it makes sense to prefer the agriculture sector to other sectors in promoting and supporting activities.

In India's case, agriculture, namely the Green Revolution, has together with liberalization policies catalysed India's remarkable growth in the past decades. The government played a crucial role in setting the agriculture sector as an engine of growth. India has managed to set the stage for agriculture-led growth effectively, so that also the poor got involved. It has shown that technological improvements in agriculture can bring about very rapid change and are able to alleviate extreme poverty (like in the case of the

Green Revolution). Especially if it is scale-neutral and not requiring high private investments such interventions can make sense on a large-scale. But risks of such fast-track growth are high in terms of sustainability and thus always need to be examined for potential negative long-term effects and hold against sustainability measures. Overall India's agriculture-led development cannot be considered sustainable – the social and ecological dimension show widely negative impacts. India's growth has been highly unequal. Fast growth has left many behind which is against the "Leave no one behind" principle of the SDGs. Especially smallholder farmers, who are very high in numbers in India, were left behind in the development process and are marginalized.

Furthermore, agriculture for development was pushed with one-sided crops and agricultural practices, which proved to be negative for the environment and a balanced diet of people in the long run. India's strong emphasis on staple crops like rice and wheat during the Green Revolution has prevented mass famines, but has also led to a crowding out of more nutritious crops like pulses and millet and diversification (e.g. in vegetables and fruits). This is connected to today's malnutrition problem. Thus, the major goal for reaching food security in agriculture development should not only be how to increase productivity, but also how to diversify food production. Farmers should be encouraged to diversify their crops. This would not only help to fight malnutrition, but also reduce biodiversity loss and will make farmers more resilient.

Interesting out of an economic standpoint is that India has not succeeded to shift its labour force away from agriculture towards the other sectors at a similar pace as the share of agriculture on GDP decreased in line with the Structural Transition theory. It shows that the right incentives and infrastructures must be in place that this shift in the structural transformation goes smoothly – for instance the promotion of the rural non-farm economy and educational programmes (e.g. VET programmes).

From the case of India one can also learn that a structural transformation in agriculture towards a "modern economy" comes with substantial changes for a country, such as new nutritional needs and new health problems (e.g. the triple burden of malnutrition). This has to be taken care of and health systems and policies have to adapt accordingly. Also simply just because a healthy workforce is needed to benefit from the demographic dividend.

The thesis shows that agriculture is too important to be treated as a residual sector. Regardless which strategy a developing country follows, it should not neglect its agriculture sector. Effective ways need to be found to achieve smooth structural transformation and a sustainable development. Agriculture holds the potential to decisively contribute to not only economic prosperity, but also food security and health, women empowerment and social inclusion of the marginalized, poverty eradication and an intact environment.

## 1 Introduction

Despite some remarkable achievements of international cooperation and national success stories of development, decades of development cooperation and nations' efforts have not resulted in the eradication of severe poverty for substantial parts of the world's population and the establishment of sustainable economic growth in the Global South (de Vries and Jochemsen 2019). There is still no silver bullet for economic growth, let alone a recipe how to pave the way for sustainable development. Interestingly, even though agriculture played the dominant role in almost all traditional economies, most of the developing countries have neglected agriculture in development as a key sector for sustainable development (Hwa 1989, Pingali et al. 2019). Is agriculture therefore a mere sunset industry and not suited for stimulating economic growth or initiating a path of sustainable development? It seems that in the developing world rather development narratives like the industrial revolution of Western states were in the minds of responsible authorities and development thinkers. This bias against agriculture has in many countries arguably resulted in a stagnant agriculture sector with subsequent shortcomings in domestic food production, balance of payment crises, and political instability (ibid).

Its central role to the world economy and inherent potential on the other hand seem evident. In 2014, the agricultural sector accounted for one-third of the global GDP (data.worldbank.org). With 60% of the world's population depending on agriculture for survival, agriculture remains the dominant sector for people's livelihoods (FAO 2015). And agriculture is of course key for our all basic need for food. But still today around 820 million people suffer from hunger and about half of the world's population from some form of malnourishment. This indicates that agricultural productivity remains low in most developing countries but also that a lack of nutritional knowledge and structural issues impede a world without hunger and malnutrition. Furthermore, agricultural practices have a big stake in the condition of the world's natural resources. Agriculture, forestry and land use change, which often times go hand in hand, account for an estimated 20-25% of the global annual greenhouse gas emissions (IPCC 2014). And today's agricultural practices with high chemical inputs and intensive land management are widely considered harmful for the environment and consequently even for human health (IPBES 2019). Moreover, the numerous smallholder farmers in the world are often times marginalized and among the poorest of the poor. Thus, agricultural development also substantially contributes to the extent of inequality and injustice in the world.

These points show that the agriculture sector has of course a much wider impact on people's lives and nature than just on the economy. When around the 1990s the sustainability concept took root, agriculture for development could no longer be seen out of a mere economic standpoint. With the Agenda 21 of the United Nations, the concept of sustainable development has established itself as a central and guiding principle for development cooperation. Following the Millennium Development Goals (MDG), sustainable development goals have been pursued since 2016 through the Sustainable Development Goals (SDG). The implementation of the SDG, i.e. sustainable development, is a prerequisite for long-term economic growth, social balance and ecological integrity. However, how agriculture can be most efficient and at the same time sustainable – in order not to collide with the other SDG – remains largely disputed. And guidance on implementation is missing in the SDG. Disputed remains also agriculture's role in the development process of a country. Certain is on the other hand that which agriculture practices are used and how agriculture evolves and adapts determines to a large degree how sustainable the world's future will be – in all its dimensions: socially, economically and ecologically. Thus, it seems a question worth thinking about.

Looking back in development history, agriculture has been in and out of fashion since the early stages of global development cooperation in the 1950s. While at times agriculture was center staged in the development process, it was neglected and regarded as sole reservoir and source of abundant labour and resources at other times. The global food price crises of 2008 and 2010 showed how fragile the system is but made food and agriculture policies a hot topic again. Moreover, the environmental crisis has rather recently changed the public's demands on farming towards a low ecological footprint.

Should developing and emerging economies count on agriculture? Neither academics nor politicians know the answer (Pingali et al. 2019). Additionally, there is a paradox in the role of agriculture in economic development. The goal of developing countries is usually to reduce its share of agriculture on their GDP and instead foster the industries and services sectors. At the same time governments often push agriculture to become more efficient and productive. This means that the more productive agriculture becomes, the more declines its importance in the overall economy. Thus, agriculture is the sector in a country's economy that *should* become less important in the long run – so why count on agriculture for economic growth and development in the first place? Most so-called developed countries' economies were stimulated by industrial innovations anyway (e.g. the steam engine for the industrial revolution) and were only accompanied by agricultural progress. It was the second and later the third sector that led to growth. A sustainable agricultural sector, however, has a lot more to offer than just potential economic growth though.

Out of an economic perspective, there are examples that agriculture as a stimulus for economic growth can actually work. India has in some ways proven this. The Green Revolution introduced in the 1950s brought enormous progress regarding productivity when India was on the brink of mass famine. It consisted of a mechanical package using advanced machinery such as tractors, irrigation systems and threshers combined with a biological package introducing improved plant varieties such as hybrid paddy and the excessive use of chemical fertilisers, both promising to raise yields. It brought India self-sufficiency in the staple grains wheat and rice. This growth initiated an impressive economic success story. But how sustainable was this growth? How can it be that a country with self-sufficiency in food production, some of the wealthiest people in the world, world-class technologies, and some of the most successful companies in the world, still has so many poor people, with farmers farming using traditional, centuries-old methods?

Of course, the task they have to fulfil is gigantic: feeding over 1.3 billion people alone in India. Soon India will be the most populous country in the world, estimated at 1.65 billion citizens by 2050 (OECD Population Projections 2020). To meet these goals, India's agriculture has undergone tremendous changes during the past 60 years and it has been the plaything of development interventions. Over decades farmers have been chased around; with different development paradigms and an ever-lasting to and fro of proposed approaches around the battle of small scale traditional and organic vs. large-scale conventional and agrochemical farming. And it won't get any easier: with climate change, especially the unreliable monsoons, many challenges lie ahead. Regardless India's challenges; agriculture provided the impetus for development – can it be a model for other developing countries? How sustainable was this agriculture-led growth? And what can other emerging economies learn from India's experience?

## 2 Research Questions, Structure & Methodology

Against this background the purpose of this final thesis is to explore the question of the role of agriculture for sustainable development with a case study on India. It brings together the latest research for the nexus

of agriculture-related economic growth, environmental responsibility and social progress. The assumption is that the ultimate goal of a development path in the sense of sustainable development related to agriculture should be a linkage between achieving equitable economic growth, sustainable agricultural practices and improved livelihoods with healthy people.

The research questions are as follows:

- What is the role of agriculture for sustainable development?
- What can other emerging economies learn from the case of India?

The thesis is after this introduction structured in a chapter on “Agriculture for Development” where an extensive scientific literature review is conducted to compile the current scientific literature on the role of agriculture for development over time. It starts off with a brief history of agriculture for development starting in the 1950s. The starting point in 1950 is chosen since the time around then can somewhat be considered as the beginning for international cooperation and at the same time it was shortly before the introduction of the Green Revolution where traditional agrarian systems were partly converted into high productive and efficient farms, which represents an interesting turning point in the recent history of agriculture. Furthermore, the question whether agriculture is suited as an engine of growth, is elaborated by screening empirical evidence. The literature review is further structured along the sustainability dimensions of “economic development”, “environmental responsibility”, and “social progress” to elaborate on the various impacts of agriculture for development. In a next chapter, India’s growth story is used as a case study and at first broadly presented. Then, the in the previous chapter introduced sustainability dimensions are illustrated and at the same time used to critically evaluate India’s growth and its consequences. Given the assumption that the goal should be a sustainable, inclusive development, India’s economic growth story – with the dominant role of agriculture – is evaluated against sustainability criteria based on the Sustainable Development Goals (SDG). Sustainability is thereby understood as a development process that takes the economic, socio-cultural and ecological dimensions as well as the well-being of future generations into consideration in the sense of the Brundtland Report (1987). Building upon the findings the research questions are then answered and discussed, and a compilation of key lessons learnt is then presented. The research questions are answered based on an analysis of the relevant scientific literature and by evaluating and critically reflecting on India’s development path considering the sustainability principles and Sustainable Development Goals. Finally, the thesis concludes with a look ahead in a last chapter.

The relevance of this study is considered high since agriculture is occupying a majority of people in developing countries and hunger and malnutrition are still major problems in many parts of the world. In fact, poverty reduction in general continues to be a central challenge for the global community. With the Sustainable Development Goals global consensus was reached to fight poverty and global challenges on a path of sustainable development. Thereby this framework as well as the Brundtland Report comprehension of sustainability are used in this work as a reference. Furthermore, this final thesis gains relevance due to a rather weak evidence base on the role of agriculture for development and its largely disputed nature. Moreover, how agriculture evolves and adapts determines to a large degree how sustainable India’s and the world’s future will be. India is considered suitable for a case study to elaborate on the main research question due to its enormous agriculture-led transformation process and geographical diversity. India has to offer some valuable lessons for the rest of the low- and middle-income countries. Its case is of global importance because of the heterogeneity of its states, many the size of countries, with its differ-

ent preconditions and development paths – but still a common, Indian strategy. This allows for an interesting comparative examination.

This final thesis has also clear limitations; due to the limited scope of this final thesis and the broad nature of the research question there is no claim to being exhaustive. Also the comparison between Indian states or India and other nations is – due to the multitude of factors influencing development and the diversity of states – still not an easy one to make. As long as there is no precise counterfactual for the whole of India, we will never know what exactly triggered how much impact. However, digging into the topic has shown early that tackling such a broad research question can be even in such a limited work fruitful and beneficial for the target group of policy makers and decision makers of development interventions. The findings of this study can contribute to a better understanding of the nexus of agriculture and sustainable development as well as critically reflect on a specific development path.

### **3 Agriculture for development**

In this chapter the idea of agriculture for development is introduced. In a brief historical summary starting in the 1950s the role of agriculture for development in the different development paradigms over time is reflected. Then, the chapter introduces how agriculture in theory affects the economic development, environmental responsibility and social progress of a country. Finally, the current evidence base on the question whether agriculture is suitable as an engine of growth is presented.

#### **3.1 Agriculture as the backbone and heart of an economy**

No doubt: Agriculture is at the heart of the economies of the countries of the Global South. The sector is vital for economic development, environmental responsibility and social progress. With 60% of the people in the Global South depending on agriculture (FAO 2015), it still today provides livelihoods for the majority, in particular in developing countries, and holds the labour and resources for the development of the industries and services sectors. For instance agriculture supplies food for the people as well as raw materials as major sources for the industry, e.g. fiber crops for the manufacturing of ropes and strings. However, despite its importance to the economy, agriculture is often times politically neglected and has remained in most developing countries, especially the least developed countries, largely underdeveloped (FAO 2002). Agricultural production in the low income countries are often times characterized by slow production due to internal difficulties such as a limited skill base and external difficulties such as the high vulnerability to instabilities of the often primary commodities they export, high fluctuations in production, and high state dependency (ibid.). Moreover, agricultural land in developing countries often characterized by degraded natural resources and land-use conflicts (IPBES 2019). And poverty rates among farmers are disproportionally high (FAO 2015). The problems are strongly interlinked with the often chronic problems of poverty, especially food insecurity. However, most of these countries have enormous unexploited agricultural potential – namely for sustainable development and thus agriculture could largely contribute to better the economic, social, and ecological situation of a country (ibid.).

#### **3.2 A brief history of agriculture for development**

Looking back in development history, agriculture has been in the global debate in and out of fashion since the 1950s, the beginnings of global development cooperation. Whereas during the 1950s and early 1960s manufacturing industries have been pushed as a first priority in development efforts and agriculture came second, soon after agriculture was centre-staged in considering the concerns of population growth and a global food crisis (de Janvry 2010). In the 1960s and 1970s under the classical paradigm of development



economics, agriculture was conceptualized as an instrument for industrialization (ibid.). The paradigm was grounded in success stories from the “Western Experience” to the then-recent “Asian miracles” (ibid.). It was also when the Green Revolution started and saved millions of lives from a mass famine. The other side of the coin would only manifest itself later. Pingali et al. 2019 argue that the Green Revolution was so successful, e.g. in India, because the technologies were scale-neutral and smallholder farmers could take advantage of the higher productivity of family labour. The technological and biological inputs were complemented by institutional support, for instance the direct procurement of food grains, minimum support prices and input subsidies. However, the focus was clearly on staple grains and regions with access to irrigation benefited more than others. To that time – not only in India – agricultural growth was held to be the key pillar for industrial growth. The Green Revolution was initiated externally. However, the history of agricultural cooperation between Western development actors and developing countries is a complex story to tell and not yet fully understood nor sufficiently researched (de Janvry 2010).

The dominance of agriculture on the political agenda persisted until around the 1980s. In the late 1970s and early 1980s the political climate changed to antiagriculture policies and the promotion of import substitution industrialization (ISI) (ibid.). Funding of agriculture related programmes and projects had fallen sharply during this time (IFAD 2001). In the 1980s macro-economic concerns dominated and were tackled in the neoliberal spirit. Namely the introduction of “Structural Adjustment Programmes” (SAP), the removal of state intervention from a free market, and the gradual dismantling of the public sector famously led by Ronald Reagan and Margaret Thatcher. However, the political economies of the agriculture sectors in countries of the Global South on which the SAP were based were not understood (Asche 2010). The new focus was on integrated rural development: Thus, the approach changed from a sector to a territory approach. Generally, during these different paradigms, similar to other areas of development cooperation, approaches oscillated from programme to project and sector (“agriculture”) to territory (“rural”) based approaches (Meijrink and Roza 2007).

When around the 1990s the sustainability concept took root, agriculture for development could no longer be seen out of a mere economic standpoint. From now on, the ecological and social spheres had to be equally included next to the economic dimension in development processes and thus the thinking became more holistically. When in 2000 the Millennium Development Goals were introduced it was agreed to have pro-poor economic growth – and which sector was better suited for this than agriculture, which was and still is occupying most of the poorest of the poor? Since the World Development Report 2008 (World Bank 2008), famously titled “Agriculture for Development”, agriculture was again in the spotlight for the global challenge to combat poverty and facilitate economic growth. The report argued that growth in the agricultural sector contributes proportionally the most to poverty reduction – more than any other economic sector. Subsequently, development projects in the agriculture field increased.

However, while the global agenda centre-staged agriculture for development over long periods, not many governments of developing countries were counting as much on agriculture. It seems they rather wanted to see their industries and the service sector grow based on the model of the so-called developed countries. In fact, most developing countries neglected agriculture in development, especially since the Washington consensus and the introduction of ISI that followed the debt crisis (de Janvry 2010). It is evident that low-income agrarian economies tend to neglect food producers (FAO 2006). However, with economic growth and the agriculture sector relatively shrinking, it has been shown that policies progressively favour farmers (ibid.).

### 3.3 Economic development

What exactly is the contribution of agriculture for economic growth? What role does it play in the economical development of a country? Surely, this is a complex field – links and relationships are intertwined, which does not always allow for clear attributions to a certain sector, but there are also some pretty straightforward impact mechanisms. The debate on the role of agriculture in economic growth is as old as development economics itself, however, the idea that agriculture is central to the growth process in poor countries is relatively recent (Block & Timmer 1994). At first agriculture was regarded by development economists as an ancillary to industrialization only, concretely as a mere source of labour and transferable capital surplus (Lewis (1954), Rosenstein-Rodan (1943), Hirschman (1958), Jorgenson (1961), Ranis & Fei (1961)). Only when Schultz's "efficient farmer" hypothesis was published in 1964 and also its following literature showed how agriculture is capable of stimulating growth – namely how growth in the agriculture sector can have significant multiplier and spillover effects to other sectors, academics started to change their thinking. The fact alone that agriculture growth improves the food security in the country illustrates its enormous leverage power. Because this in turn has a positive impact on social stability and health, and in turn again productivity and the overall economy (Meijrink & Roza 2007).

Looking at economic theory, economic growth requires an increase in total factor productivity, which in turn needs technological progress and public expenditures for infrastructure, research, health, and human capital developments etc. (Sarris 2003, Solow 1956). Structural economists like Lewis (1954) or Kuznets (1966), etc. have empirically demonstrated that growth is brought about by structural transitions. Thus one basic idea is that economic development of a developing country goes through a structural transition from an agriculture-dominated to an industry- and services-dominated economy. This demonstrates also the basis of the following impact considerations of economic development in this thesis. One can break down and classify agriculture's potential contribution to economic development into a few categories. Johnston and Mellor' identified already in 1961 in their influential article on the role of agriculture on economic growth five types of inter-sectoral linkages:

1. Providing food for domestic consumption
2. Releasing labour for industrial employment
3. Enlarging the market for domestic industrial output
4. Increasing the supply of domestic savings
5. Earning foreign exchange

They further split it up in forward and backward linkages, from the production and consumption side. Empirical work has measured the Johnston-Mellor linkages. In general, these studies have found the growth multipliers from agriculture to exceed those from non-agriculture (Block & Timmer 1994). To examine the various ways of agriculture contributing to economic growth and to evaluate India's economic growth in the next chapter, the above dimensions are used as a basis. Complementing the economic dimension, impacts on the environmental and social spheres are discussed. Of course there are overlaps between the categories, for instance the first two subchapters of "Livelihoods" and "Feeding the population" could as well be discussed under the social dimension. The rather theoretical considerations here are illustrated with examples in the next chapter with the case study of India. The chapter 3.6 discusses the whether agriculture is a suitable engine of growth.

#### 3.3.1 Livelihoods

When growth occurs in sectors that involve the poor, such as agriculture, it has a huge potential to reduce poverty. In countries of the Global South the majority of people are still engaged in agriculture and thus

usually live in rural areas (Meijrink and Roza 2007). According to Castañeda et al. (2016) 65% of poor working adults made a living through agriculture. A sustainable agriculture sector has thus the potential to provide improved livelihoods for a majority of people and therefore is a major lever for fighting poverty and under- and malnutrition. Improving livelihoods means at the same time high economic potential due to a larger, better educated, healthier workforce with higher consumption potential. Irz et al. (2001) showed that agricultural growth does contribute to poverty reduction in several ways on all levels from the farm to the national level. On the farm level an increase in agricultural output results simply in higher income, but also more employment opportunities for rural people. On the rural level it constitutes by the creation of more jobs, higher consumption and more investments and more complex value chains. On the national level it tends to decrease food prices. The world bank states that agricultural development is one of the most effective ways to end extreme poverty and boost prosperity: According to Townsend (2015) the agriculture sector is two to four times more effective in raising incomes among the poorest compared to other sectors.

On the other hand, it can also be argued that agriculture keeps people in poverty because of poverty traps – famously advocated by Jeffrey Sachs (2006). Poverty can due to a number of structural factors only be escaped in the current economic system with a significant amount of capital, which is usually not possible for farmers but would rather require financial input from the outside.

### 3.3.2 *Feeding the population*

Most developing countries rely on their own country's agricultural products to feed their population and self-sufficiency is largely prevalent, especially among farmers (Roland 2014). Only a few countries, which for instance have economies based on the export of natural resources, own the necessary foreign exchange to import their food requirements. A country needs sufficient food, but also diverse and quality food (Pingali et al. 2019). If a country wants to achieve economic growth, and the development of the industrial and services sectors, it depends on a healthy, well-fed workforce. This also holds true for a higher agricultural productivity with healthy farmers, which might represent a more sustainable way for productivity enhancement than high chemical inputs like fertilizers. It can further equip farmers with the physical and cognitive fitness for taking up new job opportunities outside farming or becoming more innovative with farming practices. Moreover, well-fed children do not suffer from cognitive impairments like their mal- and undernourished counterparts and are likelier to escape the poverty trap.

### 3.3.3 *Labour and capital*

Agriculture has labour and capital to offer, which can be shifted towards the to be developed second and third sector, namely industry and services. According to the theory of Structural Transformation this shift will mainly take place because of higher wages (Roland 2014). This is most famously described in Lewis "Model of Development with unlimited, Supplies of Labour" (1954). As stated above the agricultural sector in most countries of the Global South still occupies more than half of their populations in one way or the other, therefore, this potential is substantial.

### 3.3.4 *(Domestic) market demand*

The development of the industry and services sectors needs a market. The demand for industrial products and urbanisation is assumingly high especially among the huge share of people engaged in the agricultural sector. However, they need to have the needed purchasing power first. Through agriculture-led development farmers gain more income and thus purchasing power and subsequently consume and invest in goods from the new sectors.

Meijerink & Roza (2007) explain the importance of so called „agricultural growth linkages” which demonstrate how rural income growth is re-spent on local goods and services that wouldn't have had an outlet market otherwise. According to the authors these spin-off effects were key in the emergence of rural industries in Asia following the Green Revolution in staple grains production. Also other authors have shown that agricultural growth has strong multiplier effects on the rural non-farm economy (Larson & Shaw 2001, DFID 2005)

### 3.3.5 *Foreign exchange contribution*

Through the export of the surplus from agricultural production foreign exchange earnings can be generated. This is usually much needed in developing countries, because a lack of foreign exchange can pose a significant constraint on the growth process (Roland 2014).

## 3.4 Environmental responsibility

A sustainable practice of agriculture leads to a healthy environment and people. How agricultural goods are produced determines for instance the quality of ground water and food and consequently also our human health, and further how much the sector is contributing to climate change. Agriculture growth usually goes hand in hand with new technologies and new practices and inputs, which impact the human and ecological health. Especially in the long run the sustainability of this development is also crucial for economic growth.

## 3.5 Social progress

Equality has become a necessary corrective measure for development processes. The social dimension is next to the economic and ecological spheres constituting the concept of sustainability, which is also the basis of the Sustainable Development Goals. Development theorists have in contrast to the beginnings of modernization theory, which dominated the emergence of development policy as a political field in the 1950s, moved away from a purely monetary, growth-centred development approach. Amartya Sen (1999) and Martha Nussbaum (2003) have somewhat revolutionised the concept of development in poverty reduction. According to them, in addition to essential basic needs, further central dimensions that contribute to a "good life and a successful practical lifestyle" must be improved. This means that sustainable development means that each individual is independent, can realize his or her wishes and can participate in political decision-making processes and social and cultural life. The social dimension of sustainability can therefore also be measured against the achieved degree of freedom, dignity and the ability to unfold ones capabilities free from impediments.

Agriculture development is changing social systems fundamentally. The economic transition is usually accompanied by health, nutritional and other societal transitions, which require adaptation in policies social security nets. At the same time growth processes often times generate winners and losers. Thus, also for agriculture growth leading to economic upswing the question of social impacts during the process arises. Sustainable growth can manifest itself in for instance participative processes or an inclusive, equal growth. Unequal growth on the other hand can lead to unrest and unsustainable conditions (Sambanis 2004). We have seen enormous changes in the economies of countries of the Global South – particularly also in the agricultural sector. Policies around agriculture and food security are at the heart of many pressing societal issues.

### 3.6 Agriculture as an engine of economic growth

In chapter 3.3 we have seen how agriculture impacts economic growth. But is it worthwhile to count on agriculture as an engine of growth, meaning that overall development can or even should be agriculture-led?

According to Sarris (2003) an economy needs an engine of growth for its sustained development like industry, tourism or export agriculture. The incomes and saving from this initial stimulus can be further invested. Whereas so called developed countries were mostly stimulated by industrial innovations (e.g. the steam engine for the industrial revolution) and were only accompanied by agricultural progress, some developing countries like India, China and Taiwan, reached high growth rates with agriculture-led productivity changes (ibid.). The increased production of food was mainly used domestically due to the existing demand. Thus the domestic terms of trade for the agricultural products did not deteriorate (Pingali et al. 2019). However, a substantial part of the costs for achieving this improvement was funded by external donors, including the major international agricultural research centers (Sarris 2003). In that regard international cooperation played an important role for initiating agriculture-led growth. However, the cost per agricultural producer of improving agricultural productivity was relatively low due to the high population densities (ibid.). For agricultural growth, the framework has to be right too: According to Gérard (2014) there is a set of broad principles needed for a thriving agricultural sector boosting national economic growth: for instance macroeconomic and political stability, access to markets, information, technology, and banking facilities especially a credit system. However, what is needed to boost agriculture seems to be very case specific too. Also, the science community is still unsure about the magnitudes of the relevant elasticities of agricultural growth, as well as the ways in which these elasticities are affected by other factors (Sarris 2003).

Among development economists the potential contribution of agriculture to economic growth is still debated. Whereas some researchers see agricultural development as a precondition to industrialization, others disagree and propose other development paths. There are two polar standpoints in academia today: One side argues that agricultural development is needed for overall economic growth. The various contributions of agriculture such as livelihoods, food supply, labour, raw materials, market demand, and foreign exchange are necessary for the process of industrialization (Johnston 1970). Thus, today there is substantial literature arguing for agriculture as a valid engine of growth (Irz and Tiffin 2006, Awokuse 2009, Izuchukwu 2011, Pingali et al. 2019). The other side argues that economies are able to bypass this process of agricultural development and instead invest to build an industrial base in the first place. This view was mostly common in the 1950s, but has advocates to this day (Tsakok and Gardner 2007). Others, like Sarris (2003), came to the conclusion that there is neither solid unequivocal theoretical argument nor solid empirical proof for agricultural development as an effective engine of growth. Also Gardner (2005) found no significant evidence of agriculture leading to overall economic growth. Tsakok and Gardner (2007) on the other hand find evidence in some countries and in others not.

Given the knowledge that the effectiveness of agriculture as an engine of growth is controversial – should a country favour the agriculture sector over fostering other, in the long run more promising sectors when it comes to the allocation of funding money? Lipton (2000) argues that the conditions of a country are crucial and thus it is very much context-specific. He states favouring agriculture for development support is legitimated if;

- agriculture is the livelihood provider for a major share of the population (among them a high share of poor people)

- it is not hindering successful urbanization
- reducing urban poverty is not more cost-effective
- rural people do not gain more from urban poverty reduction
- it is inducing more economic growth than urban poverty reduction
- the agricultural sectors has disadvantages on the global market (e.g. traditional practices etc.)

## 4 Case study: India's growth story

In this chapter India's agricultural history since the Green Revolution is reflected and the impact of agriculture for overall development in the country is evaluated. After a brief introduction and history of India's growth story, India's development path is assessed along the in the previous chapter introduced sustainability dimensions of economic development, environmental responsibility, and social progress.

### 4.1 A brief history of India's (agricultural) growth

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*"Everything else can wait but agriculture cannot wait."*

Jawaharlal Nehru, former Prime Minister of India

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India is today the fifth largest economy in the world in terms of nominal GDP and one of the fastest growing G20 economies (OECD 2018). The agricultural sector is largely contributing to both employment and GDP (ibid.). Agricultural production has been increasing on average at around 3.5% annually since 2011 (ibid.). It is the largest livelihood provider in India and the backbone of the Indian economy (ibid.). Agriculture also plays an extraordinary decisive role in the socioeconomic development of the country. It is strongly interlinked with the other sectors, most industries for instance depend upon the agriculture sector for their raw materials.

India has not always pushed agriculture, it rather neglected agriculture over long periods (namely in the second and third year of the Five Year Plans respectively from 1956-1966) and allocated its resources rather in favour of the industrial sector (Williamson and Panchamukhi 1989). However, this resulted in food shortages, inflation and problems with the balance of payments (ibid.). Since the 1960s however, Indian agriculture has undergone rapid transformation when the population was on the brink of a mass famine (de Janvry 2010). The introduction of the Green Revolution when the Government of India adopted a new agricultural strategy has changed not only the agricultural policy landscape of India, but also the whole natural landscape of the country and more. It is unquestionably the single biggest technical advance in agriculture in India during the plan period and has lifted millions of people out of hunger (ibid.). The Green Revolution is a seed-fertiliser-water technology that focuses on an intensive rather than extensive cultivation (referring to the high usage of inputs, labour and capital in relation to the land area). Especially the breeding of high-yield varieties of staples, namely rice and wheat, has changed the until then traditional agriculture tremendously. As well as the country: It has transformed India from a net importer of food to a self-sufficient agricultural giant (Pingali et al. 2019). The government of India played a key role in setting the agriculture sector as an engine of growth. This was done by promoting appropriate technologies, establishing agricultural research centres, subsidizing farm inputs, providing a credit system, minimum support prices and a scheme for government purchasing, and increasing investment in small irrigation projects (FAO 2006). This made it possible even for poor farmers to get involved in the Green Revolution.

The by the Government of India introduced policy of globalisation and liberalisation in the 1990s has again opened up new avenues for agricultural modernisation. However, while evidence seems clear that

globalization and economic reforms of India have been positive for economic growth in general, it is not sure whether it has also further pushed agriculture growth (Mahadevan 2003). But at that time India has finally emerged as a big player in the global agriculture market. From 2013-2018, the country's agriculture exports have tripled (OECD 2018).

These two developments, namely the agriculture-led growth starting in the 1960s with the Green Revolution together with the liberalization policies of the 1990s have been credited to have catalysed the country's growth in the last two decades (ibid.). There was a remarkable structural transformation from a subsistence based agricultural economy to a modernized agriculture within only a few decades. Besides the increases in per capita incomes, the growth process has triggered greater urbanization rates, increase in literacy rates, population growth and poverty reduction (ibid.).

It has been driving India's economical growth and achieved substantial benefits, but it has failed in other respects. Where the Green Revolution was at first considered a huge success, later on the downsides came to light too, especially in terms of human and environmental health, and also brought about a lack of self-sufficiency of farmers. Also in other regards remain many challenges – despite the notable achievements of the Green Revolution: among them, the prevalence of very large numbers of poor smallholders, low productivity, pressure on natural resources such as water, persistent food insecurity, and an underdeveloped food processing and retail sector (Pingali et al. 2019). In recent years, public investments in agriculture have slowed down compared to the other sectors, maybe the agriculture sector is somewhat worn out as an engine of growth by now (FAO 2020). Balakrishnan and Parameswaran (2007) argue that whereas the agriculture sector was the initial stimulus for economic growth, creating important supply and demand linkages for growth of the other sectors, later on the third sector (contributing highly around 1980) took over as the main accelerator of growth. However, the importance of the services sector is controversial. The second sector took off slowly around the 1980s, with less contribution to overall growth, but was then, at least for a short time, at the centre of new growth dynamic in India (ibid.). The decrease of the agriculture sector's importance with increasing economic progress is postulated in the structural transformation theories.

Despite the prominent role of India's agricultural sector for its growth story, it is today widely in a crisis. Waves of farmer suicides drew attention to mounting agrarian distress. It appears cynical: Smallholder farmers as the main provider of food and nutritional security to the nation are left behind by the countries progress. Also studies confirm the discontent of most farmers. According to the study „State of Indian Farmers“ (Singh et al. 2015) 76% of farmers want to give up farming. The main reasons they stated were the repeated losses due to unseasonal rains, drought, flood and pest attack. 61% of farmers reported that they would rather be employed in a city. One may ask whether this is the price India has to pay for its development? And whether this model of smallholder farming is still fit for the future? Eswaran and Kotwal (1994) argue in line with the structural transformation theory that shifting labour from agriculture into industry would be key in improving the livelihoods of the poor. It is a balancing act that tribal and traditional farming practices can be preserved where farmers wish to do so and develop the farming sector elsewhere, while supporting both to find their way out of poverty. Many structural hindrances limit farmers' off-farm opportunities, foremost a lack of education.

While there are still tribal farmers living in remote areas practicing traditional subsistence farming, India's agriculture as a whole is long embedded in the global markets. India is due to its opening up closely intertwined with the globalized market mechanisms and in fact, globalisation has had a decisive impact on India's economy. It has been shaped by domestic and international policies whereby domestic policy

lost a bit of its autonomy. Globalisation has brought about high growth rates for India, but often times at the cost of sustainability, namely especially the environmental and social dimensions as we are about to learn in the following chapters.

## 4.2 Economic development

India's agriculture-led growth was economically in many ways a success, whereby the Green Revolution provided the impetus for India's remarkable economic growth.

### 4.2.1 *Livelihoods*

In countries of the Global South the majority of people are still engaged in agriculture and thus usually live in rural areas. In India, the agriculture sector provides livelihoods for millions of people – it is the largest livelihood provider in India (FAO 2020) – and therefore is a major lever for fighting poverty and under- and malnutrition. While today's agriculture in India only contributes 15 percent to its GDP, it is with 44 percent still by far the largest industry in terms of employment (Plecher 2020, data.worldbank.org). Thus, when fighting poverty on a large scale, the agriculture sector is key. Subsequently, the high economic growth rates in India have indeed led to an absolute poverty reduction (FAO 2006, Datt et al. 2002). However, the scientific community is not unanimous about the relative figures. Whereas Bhalla (2000) sees a reduction also for the relative poverty figures, Sen (2001) argues that they might even have risen (Sen 2001). The highest production increase happened in the 1970s and 1980s, the biggest reduction in poverty in the 1980s and 1990s, which was also the time of economic liberalization (FAO 2006). Enhanced production itself has reduced poverty, but also the greater income growth later on (ibid.). The high production of staple grains in the context of the Green Revolution has made big quantities of food available (Pingali et al. 2019). India witnessed an increased, high level of growth in food consumption, also due to high population growth (ibid.). Food security and a balanced diet in rural regions and for smallholder farmers are still influenced by India's own production (ibid.).

However, poverty still persists quite extensively, and many, especially smallholder farmers and other marginalized, have not benefited from India's economic growth (ibid.). As discussed in 4.4 the progress was largely unequal. India has not managed to take along everyone on the path of development – unfortunately, the speed of increase in per capita incomes in India has not been met with a similar pace in the reduction of undernutrition and malnutrition (ibid.). India is still categorised with "serious" hunger levels as per the Global Hunger Index (GHI). There are large numbers of extremely poor and vulnerable households who are unable to afford basic and adequate nutritious food, lack access to safety nets and farm and food entitlements. South Asia, and at the forefront India, has the largest absolute number of people suffering from chronic hunger and malnutrition (World Hunger Report, 2016). Malnutrition is especially among women and children persistent. In 2016, India had the highest number of moderately and severely underweight children and adolescents in the world. Thus, malnutrition is still a major problem despite economic growth and reduction in poverty. Although the prevalence of undernourishment in the region in the past decade is reduced by 1.7 per cent annually, the failure to reduce the absolute number of the undernourished remains a major concern (FAO 2020). It shows that economic and agricultural growth alone don't solve the problem and that the poor disproportionately bear the burden of hunger and food insecurity. But why is under- and malnutrition so persistent in India despite the country's self-sufficiency in food production? What were the shortcomings during the rapid development of India?

First of all, the food production trend has almost side-lined smallholder farmers and their food security concerns, with its crop-specific (mainly paddy, wheat and cash crops), region specific (irrigated regions) and technology specific (breeding and biotechnology, mechanization etc.) approaches, often driven by



other concerns of national food production, market etc. (Choudhury 2019). Especially the increasing focus on crops like paddy and wheat, at the cost of local nutritious crops like millets have contributed to nutritional deficiency (Pingali et al. 2019). Secondly, the disadvantaged role of women is also a major obstacle as they lack decision making power and choice within the household especially around food and farming. While agriculture is getting feminised, largely due to increasing male migration, women increasingly struggle to make ends meet with lack of access to credit, inputs, information, training, safety net and land rights (ibid.). This shows that during the economic growth process not much attention was paid to such social issues. Moreover, food price shocks of 2008 and 2011 had widespread negative nutritional, poverty and welfare consequences (Gustafson 2013). Frequent extreme weather events, exacerbated with climate change, resulted in significant crop loss. Over the years South Asia has also witnessed a sharp rise in the prices of staple food, posing an additional threat to the poor and vulnerable sections. Lastly, an increase in farm income is critical for enhanced food access and other development outcomes, as the regional rural economy is getting increasingly monetised (Choudhury 2019). However, farm income is not increasing as desired because of a lack of remunerative prices realisation from the existing marketing structure, stagnant productivity, lack of reform in agriculture land policy and increasing farm stresses due the augmented frequency of disasters (ibid.). And the present policy regimes favour commercial agriculture and cash cropping by large farmers.

A way to fight poverty is through social welfare and social security systems as well as empowerment of the people. And that's what India has tried to do – at least with the social safety nets. This was possible since the strong increase of public revenue has eased out the resource barrier to improve safety nets (Drèze & Khera 2017). This is a direct effect of the overall economic growth in India. The taken measures can help people to find their ways out of poverty – which in turn will be favourable for the economy as well. However, the schemes have also been criticized for their design, corruption and discouraging farmers to grow crops that are very cheap to get with the Public Distribution System (Pingali et al. 2019). All in all social systems, entitlements and empowerment are important for fighting poverty and should be adapted according to the quickly changing circumstances. So far the livelihoods couldn't improve at a similar level like the economic figures.

#### 4.2.2 *Feeding the population*

Due to India's growth the share of undernourished people was reduced from around 24% in 1990-92 to 14% in 2016-18 (FAOSTAT 2020, OECD 2018). The Green Revolution has clearly helped to achieve India's self-sufficiency in major grains like wheat and rice. However, nutrition related problems are by no means solved as the previous chapter has shown. The Indian growth story brought about some major paradoxes, such as the simultaneous existence of undernourishment, over-nutrition and micronutrient deficiencies, the prevalence of high growth states and very poor states at the same time, thus regional inequality, rural and urban food insecurity and the growing incidence of a triple burden of malnutrition (where undernutrition, overweight and obesity, and micronutrient deficiencies co-exist) (Griffiths & Bentley 2001). Compared to other countries with similar economic growth and a similar recent structural transformation India has still much higher rates of child stunting and wasting (UNICEF 2020). Policies supported strongly the new major crops (staple crops like rice and wheat) which led to a crowding out of the former, traditional crops and varieties, and thus may also have discouraged farmers to diversify their production (Pingali et al. 2019). This has led to poor access to nutritious diverse foods and thus an often times one sided diet leading to malnutrition rather than undernutrition. Malnutrition leads not only to immediate health issues, but also to a myriad of cascades of negative long-term implications such as im-

paired cognitive development of children, subsequently worse school performance, and ultimately huge economic losses to the family and nation (Thurow 2016).

According to Pingali et al. (2019) the change to an intense focus on staple cereals during the Green Revolution—especially rice and wheat—has led to nutrient imbalances in the food system that contribute to both obesity/overweight as well as micronutrient deficiencies without fully resolving the undernourishment challenge. The former main crops such as millets and pulses consisted of higher nutritional values. Also the crucial diversification of the diet is often times not possible due to unavailability or lacking access. Pingali & Khwaja (2004) show how consumer preferences move away from quantity to quality and start substituting traditional staples with non-staples. Pingali (2019) could already show how the share of staple grains—rice and wheat—is declining, and households are moving towards a more diversified diet.

The growing numbers of working age people entering India's labour force promise potential returns (demographic dividend), however a healthy workforce and a low incidence of undernourished children are prerequisites. Unfortunately, this holds for large parts of the population not true. In that sense India's development is lagging behind or has even failed. Thus it is crucial that national policies and the health systems adapt accordingly. The nutrition transition towards over-nutrition, other malnutrition and the rising incidence of non-communicable diseases calls for policies that promote food system diversity, quality and safety rather than only calorie sufficiency. Accordingly, agriculture needs to adapt – away from the staple grains to more diversity. Research has shown that helping households diversify their diets by increasing access to diverse foods through markets as well as increasing income and livelihood opportunities is important for tackling malnutrition (Busert et al. 2016).

#### 4.2.3 *Labour and capital*

As we have seen above the agriculture sector provides livelihoods (respectively employment) on a large scale in developing countries and contributes funds for capital formation in many ways such as agricultural taxation. Agriculture is also providing raw material to non-agricultural sectors of the economy. For economic development and the intention to boost the industry and services sectors, agriculture labour and capital play a special role as well. In India, the agricultural share in GDP has declined as the structural transformation theory (Lewis 1954) suggests, labour productivity has improved, urbanization has increased, and poverty rates have been reduced (Pingali et al. 2019). According to theory the process of structural change should lead to a reduction in the share of people employed in agriculture due to a shift to more attractive job opportunities in the other sectors (especially due to higher wages in urban areas and job opportunities for the unemployed surplus of agricultural workers). However, the decline in the agricultural share in GDP was not accompanied by a respective an equally strong reduction in agricultural proportional employment even though urban wages grow faster than rural ones (Bhagat 2017). The decline of agricultural importance for GDP is impressive though, also in rural India: The share of agriculture in rural income has reduced from 72% to 39% in the last 40 years - and this when Indian rural output has increased by almost seven times (Chand, Srivastava, & Singh, 2017). However, also the workforce is shifting – only at a slower pace than the revenue figures. The workforce occupied in the agriculture sector declined from 1991 when it was 63%, to 52% in 2009 and to 43% in 2019 (Plecher 2020, data.worldbank.org). But with still almost half of its people in the agriculture sector, the shift of labour didn't go as expected. So why is the shift from the abundant agricultural workforce to the more profitable sectors lacking behind? Pingali et al. (2019) argue that in India rural to rural migration patterns and seasonal migration as agricultural labour still dominates. They explain the absence of this shift with suboptimal market conditions and argue that poor access to appropriate skills, geographical challenges, high search and entry costs into urban and non-agricultural labour markets have prevented a smooth outmigr-

tion of underemployed labour from the agricultural sector to the non-agricultural sector. Consequently, more non-farm income opportunities should be available. The rural non-farm economy has the potential to act as a conduit for the resource flows from the first to the other sectors and thus represents an important link for economic growth.

Another source for the workforce is to include people who were left out so far – especially young people and women. This inclusive transformation would be key to reduce rural poverty and foster economic growth, and offers great opportunities also for gender equality and minority inclusion. Nationally representative data suggesting that roughly 90% of farmers' households already rely on some form of non-farm income source for their livelihoods (Chandrasekhar & Mehrotra 2016). This shows how important non-farm income already is for food security. Moreover, during droughts or other distresses farmers have been found to seek income diversification already in the non-farm sector (Ito & Kurosaki 2009). Along the food value chain there are many employment possibilities and non-agricultural employments can be complementary to the development of the agricultural sector (Foster & Rosenzweig 2007). The traditional paradigm seeing rural and agriculture as the same has long surpassed, however, it still seems to stick in the heads of people since the rural non-farm sector and its synergies with agriculture weren't considered as sufficiently interesting (Meijerink & Roza 2007).

#### 4.2.4 *(Domestic) market demand*

In India it has been found that whenever there is slow or even negative agricultural growth, the industrial sector begins to struggle - mainly due to a lack of demand for the industrial products (Bhattacharya and Mitra 1989). An increase in agricultural production on the other hand leads to an increase in the home market for manufactured goods and services. This in turn boosts economic growth. This shows how important the agricultural sector and its farmers are for the market of the new sectors. However, a more recent empirical confirmation of this finding was not found and thus has to be interpreted with caution.

However, income, especially of smallholder farmers, is currently widely still too low for bigger investments and consumption (FAO 2015) and the subsequent boost in demand did not materialise as theory suggests. But the introduction of cash crops and migration work provides many farmers already with some purchasing power for the markets. Through a sensible further expansion of the non-farm employment sector, additional income could be generated. Once the purchasing power is available there lies a big potential. "A stagnant rural economy with low purchasing power holds back industrial growth in many developing countries", was stated already in the World Development Report of the year 1979. And indeed, the growing demand of urban and rural India for food and non-food items from the rural sector inherit great opportunities for further growth (Khwaja et al. 2005). However, the demand is towards food system diversity and thus small farms commercialization and diversification with stronger farm-market linkages have to be further promoted – and not just large quantities of staple grains. The status of smallholder farmers can be strengthened by forming cooperatives and producer groups in order to reduce the high transaction costs.

#### 4.2.5 *Foreign exchange contribution*

India has emerged as one of the largest agricultural exporters globally. Several key commodities in the global market are major contributions from India, e.g. India is among the largest exporters of rice and buffalo meat in the world (OECD 2018). These are consequences of the Green Revolution and generate foreign exchange earnings. With a negative trade balance of \$125B (India exported \$292B and imported \$417B) this is important for the country (OECD Profile India). When India didn't invest much in the agriculture sector and rather fostered the industry sector, namely during the second and third Five Year

Plans (period 1956-1966), the growth process spluttered, and due to the lack of foreign exchange earnings, it became difficult to afford imports (Williamson and Panchamukhi 1989). This shows the uttermost importance of foreign exchange earnings for a country. As described in the introduction to this chapter the introduced liberalization policies and today's trade treaties in this globalized world make India an important global player. While most developing countries are mainly exporters of primary products, India has diversified its exports and don't only rely on primary goods anymore for their export earning. This is economically important because according to the Prebisch-Singer (1950) hypothesis primary goods are less favourable in global trade, and terms of trade deteriorate because the price of primary goods declines relative to the price of manufactured goods in the long run.

### 4.3 Environmental responsibility

After the first years of the wonders of the Green Revolution problems came to light: Human and environmental health are suffering from high chemical inputs and the decreased biodiversity, and the improved varieties turned out to be high yielding in good years, but not resilient in bad years, such as during droughts and water logging. When the discussion about sustainability came up, the Green Revolution technologies got into critique and its practices were considered largely unsustainable (IPBES 2019, Rahman 2015). Traditional farmers had to gradually abandon their traditional principles around ecology and resilience during the Green Revolution. Small farms now look more uniform and less diverse, with animals gone and trees felled. Reduced practice of agro-ecological approaches have led to a loss of soil fertility, vanishing pollinators and predators, increasing frequency of crop failures and risks, contributing to hunger and migration (IPBES 2019). Moreover, there has been significant opposition to genetically modified crops and fertilizers in India and around the world. In India especially due to the allegedly cancer risk. Even though there has not been found clear evidence for this yet (Pingali et al. 2019), it has slowed down and complicated research and development in the field of agriculture and even more so the application. Technologies will probably remain key to further boost agriculture, but people are worried about negative impacts, and thus new technologies and practices need to reduce externalities to human and environmental health. Moreover, the tribal and rural side of India has to be respected and introductions of new agrarian models have to be culturally sensitive.

Sustainable agriculture contributes to environmental services such as soil conservation, watershed services, biodiversity, and carbon sequestration (IPBES 2019) and only if these services are maintained intact, India's agriculture has a future. This is sadly currently endangered in India. Indian policies have fostered the strong focus on staple crops like wheat and paddy which resulted in a levelling of the land and reduction of environmental services, especially biodiversity, for instance due to injudicious use of inputs. This way of agriculture growth on the expense of the environment has to change towards more sustainable approaches, otherwise not only the environment, but also the economy will suffer in the long run. „Sustainable intensification“ via technology enhancement, scientific knowledge and management improvements, can be a way forward (Pingali 2012, Pretty et al. 2011). It means increasing agricultural outputs without increasing inputs (such as fertilizers etc.) and reducing externalities such as greenhouse gas emissions. Also, agrofarming, traditional methods, farm-sovereignty, networks of participatory social learning have proven to contribute well to sustainable agriculture (Choudhury 2019).

Another key challenge is climate change. Whereas farmers already today struggle with its impacts, the effects will only get more challenging in the future. Precipitation, especially the onset of the monsoon, will be even less reliable and extreme events will be more frequent. Studies have clearly shown the negative effects of temperature and rainfall shocks on agricultural productivity, labour productivity and health

of individuals within the country (Somanathan & Somanathan 2009, Majra & Gur 2009). Furthermore, agroecological zones suitable or not suitable for the Green Revolution have brought about unequal growth and in result regions lagging behind. For Indian states bypassed by the last “revolution” there should be customized solutions to bring yield increases to a more diverse group of crops.

#### 4.4 Social progress

The introduction to this chapter has already hinted at social grievances such as the dissatisfied farmers who by the majority would like to leave farming but don't have the opportunities. In general, the marginalized farmers who were left behind strike as one of the main transgressions of India's rapid growth story. Especially smallholder farmers, who represent the large majority of farmers, have been traditionally marginalized and are widely considered left behind (IFAD 2013). Also, the other economic chapters, foremost “Livelihoods” and “Feeding the population” have already touched on many social issues such as gender inequality and persistent malnutrition which won't be elaborated again here.

Most studies claim that India's growth story has been highly unequal, especially during the development phase between 1983–2012 inequality has risen – particularly in the early 2000s (Dang & Lanjouw 2018). Chancel and Piketty (2017) show that whereas between the 1950s and 1980s income inequality has declined, it has increased since 1980. Even though most would agree (Pingali et al. 2019) it is still partly debated in the scientific literature when the inequality rise took off and how far India has neglected the poor. Datt et al. (2002) for instance even observe that pre-1990s growth in India didn't leave the poor behind. But regarding the more recent years there is not much doubt that the poor have largely been excluded from benefiting from the growth process (Pingali et al. 2019). Rising inequality levels also hold true for states – Ravallion and Datt (2002) find that economic growth has in some states been more pro-poor than in others. Panagariya et al. (2014) underline that economic growth and progress is indeed not a pan-India phenomenon and subnational growth processes are very different. Whereas some states took off to remarkable growth stories, others fell behind, for instance those who were lacking water for irrigation to successfully adopt the Green Revolution technologies.

Looking at individual social progress of people and their ability to unfold their capacities in line with theories of Amartya Sen (1999) and Martha Nussbaum (2003) India's growth story reveals once more its flaws. Unfortunately, there are still way too many who are still by far not reaching such a degree of freedom and state of “good life”. Empirical evidence comes for instance from Chatterjee (2008) who has in this context written on India's divide with its economic growth and rise as a superpower but having at the same time large marginalized groups and even a majority of the population who is still illiterate, impoverished, and lacking basic civil and human rights.

## 5 Conclusion & Discussion

Looking at the initial research question asking what role agriculture plays for sustainable development we can now state based on the consultation and analysis of the relevant literature: Agriculture has manifold impacts on sustainable development, namely on the economic, environmental, and social spheres. Agriculture is providing livelihoods, is feeding the population and supplying raw materials for the other sectors, it can make labour and capital available for the other sectors, it is in itself a market with a big potential, it creates foreign exchange earnings, it determines largely about the health of the environment and people, and also strongly influences poverty rates and equality among people. Thus, the role of agriculture for development is doubtless a crucial one. The literature shows that agriculture-led growth can be a valuable strategy for development. However, this is not necessarily universally applicable because it is

largely context-specific, and a certain set of conditions should be fulfilled like introduced in chapter 3.6 (which was the case in India), e.g. agriculture must account for a large share of employed people. There is no one-fits-all solution for the contribution of agriculture to economic growth or sustainable development. Since the agriculture sector involves a high proportion of the poor, it has a huge potential to reduce poverty with pro-poor growth on a large scale. Out of an economic standpoint, it is still debated in the scientific community whether agricultural development can be an effective engine of growth and whether it makes sense to prefer the agriculture sector to other sectors. Agriculture development is influenced by a multitude of factors, is highly complex and embedded and dependent on global conditions and the domestic (policy) framework. In India's case, agriculture, namely the Green Revolution has together with liberalization policies catalysed India's remarkable growth. The government played a crucial role in setting the agriculture sector as an engine of growth. But of course agriculture for development is not per se good or bad, it rather depends on how sustainable the path is followed. Nevertheless, the sector is from what we have seen in the literature review somewhat predetermined to lead a country's development because it engages for instance a majority of people in most developing countries. It therefore represents a major lever for fighting poverty.

Looking at the history of development paradigms, agriculture got in and out of fashion as an important contributor for development. Even though agriculture's contributions to economic growth are pretty well known, many impacts, especially multiplier effects still remain disputed. The perception of agriculture has changed significantly since the initial Big Push idea and classical paradigm of agriculture on the way to industrialization that prevailed in economic thought starting in the 1950s where agriculture was seen as a mere sunset industry. Neglecting agriculture at all or at least in the social and ecological dimension has brought about some hunger crises, inequalities, missed opportunities and millions of marginalized farmers still living in poverty. The understanding today has broadened and the contexts and conditions have changed a lot. The neglect of agriculture over long times in development paradigms cannot be justified when we look at the empirical literature. Starting around the turn of the millennium this got widely recognised by governments, NGO's and donors. Subsequently the sector got more support, but not only agriculture, the rural non-farm sector and the topic of migration became prominent as well. It has further shown that current development paradigms matter a lot when it comes to the question of funding – depending on pro or contra agriculture-led growth paradigms, support for agriculture was varying massively. International development cooperation organisations could today in fact play a lead role in supporting countries towards better integrating agricultural systems and for instance share from their diversified background of experiences best practices and make them available on a shared platform.

The since 2008 re-emerged higher status with the paradigm of agriculture for development has proved to work well in several countries and low and middle income countries pay more attention to their agriculture sector again. The already presumed dead sector has shown to be too important to ignore. Unfortunately, in many countries it is still not taking off, especially in Sub-Saharan Africa where a successful implementation would be urgently needed. FAO and the World Bank have called for recapitalizing agriculture, investing more in the sector drawing upon success stories and integrating countries of the Global South better in the multilateral trading system (FAO 2002, World Bank 2008). According to FAO (2002) public investment in agricultural research and extension should be increased, and the access to financial services, productive resources and support services improved.

Agriculture for development has always also encountered strong headwind. It was as we have seen in the historical summary especially in the beginning by development thinkers not considered as a suitable

stimulus for growth, but especially the wonders of the Green Revolution has taught them differently. But when the Green Revolution did not succeed in Sub-Saharan Africa and first negative aspects regarding human and environmental health came to light, sceptics doubted agriculture's role for development once again. Moreover, globalisation and liberalisation policies in the 1990s have reduced the economic potential of the agriculture sector of many countries since highly competitive products entered the market. Low-income countries exporting most of their agricultural output suffer from the strong international competition in the context of international trade of a globalized world. Moreover, whereas many industrialized nations have a de facto protectorate on their agricultural products, poorer countries often end up with unfavourable conditions. This thought stems from the famous Prebisch-Singer (1950) hypothesis, which sees the marginalization of developing countries from global markets as a major problem. This would indicate that an agriculture led growth, especially for the least developed countries, is not very promising. First we would have to overcome the marginalization and change the institutional framework or even the global terms of trade. Furthermore, an agrarian society or a mere policy focus on agriculture might seem backward in the eyes of reformists in the low- and middle-income countries. Also, agrarian products and productivity have clear limitations and cannot be refined like in the other sectors. These points indicate that a successful economy competing in the global market usually can't be agriculture-dominated in the long run and a shift towards industries and services is the logical consequence.

Regarding the second research question, India has many lessons learnt to offer. India has undergone a remarkable structural transformation from a subsistence based agricultural economy to a (partly) modernized agriculture within only a few decades. However, looking at the case study of India and reflecting on the sustainability of its growth story one has to state based on the findings that the overall development can not be considered sustainable – the social and ecological dimension show widely negative impacts. However, the agriculture-led growth was at least economically in many ways a success, whereby the Green Revolution provided the impetus for India's remarkable economic growth. Flexibility for the different states to handle the unique development challenges to emphasis on their respective comparative advantages and specific conditions paid out in India and makes a strong point for non-rigid policies and customized context specific agriculture development solutions. Also, India has set the stage for an effective agriculture-led growth as we have learnt: e.g. by promoting appropriate technologies, establishing agricultural research centres, subsidizing farm inputs, providing a credit system, minimum support prices etc. This made it possible even for poor farmers to get involved in the Green Revolution, which seems an important point also for other emerging economies to consider.

However, despite India's share of agriculture on GDP decreased in line with the Structural Transition theory, India has not fully succeeded to shift its labour force away from agriculture towards the other sectors at an equal pace. This also points out that economic transformation theories and more generally theoretical impact mechanisms of growth as discussed in chapter 3 not always work out like expected in practice. The slow rate of shifting labour from agriculture to non-agricultural sectors represents an important barrier in India. It is holding back India and keeps it trapped as a still somewhat agrarian country. India could not provide the right incentives and infrastructures to farmers so that this shift in the structural transformation could go smoothly – for instance better job opportunities in the rural non-farm economy. This came out in India's case study as an important point: Alongside with agricultural development the rural non-farm economy has to be promoted (and to be distinguished from agriculture within the rural development framework). Attractive job opportunities for structural transformation with "smart migration" can boost the rural economy. Another source for the workforce would be to include people who were left out so far – especially young people and women. An inclusive transformation is key to reduce

rural poverty and foster economic growth, and offers great opportunities also for gender equality and minority inclusion.

Moreover, whereas the Green Revolution has arguably prevented a mass famine and made India self-sufficient in staple grains, the downsides of the Green Revolution, namely negative impacts on human and environmental health, only later came to light. Today the environment, especially the biodiversity, is widely degraded. Ground water tables are so low that it is threatening the water availability in the future. Thus we can learn from the example of India that technological improvements can bring about very rapid change and are able to alleviate extreme poverty, especially if it is scale-neutral and not requiring high private investments such interventions can make sense even on a large-scale. But the risks are high and always need to be examined for potential negative long-term effects and held against sustainability measures. We should have learnt by now through vast empirical evidence that depleting natural resources is no reasonable strategy in the long run. Agricultural practices must become more sustainable – for instance through sustainable intensification, agrofarming, traditional methods, farm-sovereignty, or networks of participatory social learning which have proven to contribute well to sustainable agriculture. Not very surprisingly, there seems to be a trade-off between faster growth and sustainability respectively inclusive poverty reduction. Facing the challenges of climate change and an ever changing economical, social and political environment farmers need to constantly adapt and with them, policies need to be regularly updated. If decreasing natural resources like ground water and the impacts of climate change are not taken seriously, the supply of sufficient food will be endangered. India's development path is largely contradicting the core principal of intergenerationality by disregarding the wellbeing of future generations, in particular looking at environmental destruction and social inequalities.

Unfortunately as we have seen with the example of India, fast economic growth is seldom inclusive growth and the most vulnerable are often times the ones left behind. In India, among the marginalised and the poorest of the poor are the smallholder farmers. They are absolutely essential in India's growth narrative, however, they were largely neglected, have little voice and often don't benefit from India's gains. However, according to the concept of sustainable development, economic growth should also benefit the poor. Thus development in India should be more "pro-poor". This could be manifested by policies such as extension services, land redistribution and improved access to inputs and credit. Furthermore, the development process should be more participative. For instance, smallholder farmers should be involved in multi-stakeholder platforms and connected to policy, research and market actors. India boasts itself as the largest democracy in the world – it should act like it. Today, unequal growth and climate change threaten India's ability to sustainably and equitably manage an economic and nutrition transformation. India needs to steer towards inclusive and sustainable growth, otherwise it could backfire badly in the long run.

India's example also teaches us that a structural transformation in agriculture towards a "modern economy" comes with substantial changes for a country, such as new nutritional needs and new health problems. Non-communicable diseases, diabetes and the so-called triple burden of malnutrition (consisting of undernutrition, overweight and obesity, and micronutrient deficiencies) come up. This has to be taken care of and health systems and policies have to adapt accordingly. Regarding nutrition, agriculture needed to become more productive at first, which was largely achieved to produce sufficient quantities. But today diversification has become more relevant, but the shift is not yet visible. Whereas further growth in productivity is required to feed the growing population and eradicate undernutrition, diversification is needed to fight malnutrition and achieve a healthier diet from which the economy benefits in turn thanks to a healthy workforce. India's strong emphasis on staple crops like rice and wheat during the Green Revolution has prevented mass famines, but has also led to a crowding out of more nutritious crops. This is



connected to today's malnutrition problem. Thus, the major goal for reaching food security in agriculture development should not only be how to increase productivity, but also how to diversify food production. Therefore, policies have to be adapted regularly according to the transition, e.g. away from staple grains (respectively away from the focus on mere calorie sufficiency) towards more diversified foods, thus from quantity to quality, diversity and safety. Moreover, farmers should be encouraged to diversify their crops. It is not only helping to fight malnutrition, but a higher diversity of crops and foods is also more resilient and supports our ecosystems, mainly the much endangered biodiversity. Additionally, food and agriculture related safety nets and schemes need to be in place to support farmers, but not discourage them from farming (how the Public Distribution System has done). Smallholder farmers' collectives and cooperatives are a good way for the exchange of information (e.g. also on healthy diets) and practices and to gain more power or enable contract farming. In pushing agriculture for development, linkages to markets and value chains are important – especially also for smallholder farmers. Transaction costs need to be reduced (less intermediaries) and smallholder farmers' bargaining power and commercialization efforts strengthened. Unfortunately, smallholder farmers' purchasing power in India stayed widely very low – against the theory of agriculture-led development. The subsequent consumption increase did not take place. For commercialization and higher purchasing power farmers need access to capital, markets, technology, and “safe” non-farm livelihood opportunities.

## 6 Key lessons learnt

The following key lessons learnt are derived from the analysis based on the relevant literature and the case study of India:

- Agriculture-led growth can be a valuable strategy for development and has the potential to reduce poverty on a large scale. However, whether the agricultural sector represents an effective engine of growth and is to be preferred over other sectors is controversial and largely context-specific.
- India has not succeeded to shift its labour force away from agriculture towards the other sectors at a similar pace as the share of agriculture on GDP decreased. The right incentives and infrastructures must be in place that this shift in the structural transformation goes smoothly – for instance the promotion of the rural non-farm economy and educational programmes (e.g. VET programmes).
- A structural transformation in agriculture towards a “modern economy” comes with substantial changes for a country, such as new nutritional needs and new health problems (e.g. the triple burden of malnutrition). This has to be taken care of and health systems and policies have to adapt accordingly. A healthy workforce is needed to benefit from the demographic dividend.
- Agriculture for development is usually pushed with one-sided crops and agricultural practices, which turned out to be negative for the environment and a balanced diet of people in the long run. This is connected to today's malnutrition problem. Thus, the major goal for reaching food security in agriculture development should not only be how to increase productivity, but also how to diversify food production. Farmers should be encouraged to diversify their crops. This will not only help to fight malnutrition, but also reduce biodiversity loss and will make farmers more resilient.
- India's growth has been highly unequal and has left many behind, especially smallholder farmers. This is against the “Leave no one behind” principle of the SDGs. Development must be more inclusive.
- Technological improvements in agriculture can bring about very rapid change and are able to alleviate extreme poverty (like in the case of the Green Revolution). India has managed to set the stage for agriculture-led growth effectively, so that also the poor got involved. Especially if it is scale-neutral and

not requiring high private investments, such interventions can make sense even on a large-scale. But risks of fast-track growth are high in terms of sustainability and thus always need to be examined for potential negative long-term effects and held against sustainability measures.

## 7 The look ahead

Regardless whether or not agriculture acts as an engine of growth for an economy, the sector is of utmost importance for most developing countries. And one thing is certain: Agriculture won't stay the same, but will rather continue to change rapidly. There are a lot of challenges, but also opportunities ahead. The in the SDG prominent goals of sustainable and inclusive development won't be easy to achieve. It has become clear that sustainable development involves much more than just overcoming material deficiencies. At least awareness for the need for sustainable development has arguably never been greater than today. However, the actual significance of sustainable development for individual countries will only become apparent when we see how the Sustainable Development Goals were implemented.

Unfortunately, India's path followed doesn't look very promising so far looking at the bigger picture of sustainable development. However, recent government schemes make slightly optimistic that also these issues are tackled. In the future, the probably biggest challenge poses climate change, which will force farmers to constantly adapt. This might further increase regional disparities because the intensity of impacts due to climate change varies widely over the country. At the same time agriculture itself is a significant contributor to greenhouse gases and agriculture has to become more sustainable. Some of today's agricultural practices which are harmful for the environment and human health might soon die out. This will lead the way for more sustainable practices that will prove more resilient. We can only hope that India's focus on rice and wheat will open up for more diversification in food items. Biofuels and genetic engineering of crops have the potential to change India's agriculture too.

Another predictable significant change is the rising population. The increase in young labour force holds a great opportunity for economic growth. However, it also poses major challenges because policy innovation will be required to provide employment and food security for them. Moreover, it is very likely that urbanization will continue to rise, probably even more rapidly. It is possible that the in the structural transition yet missing shift of India's rural people engaged in agriculture to other industries will make up leeway. Another important trend that seems to be about to emerge is the higher importance of women in agriculture and in the labour force in general. It still seems a long way to go for gender equality and the integration of women in the paid work sectors, but its potential is very high, for economic but also social development. Sustainable on-farm labour-saving technologies increasing productivity could one day launch a Green Revolution 2.0. However, there are still many structural issues to be solved first, such as labour market frictions, lack of access to financial markets, poor education, and the lack of land tenure rights to name only a few.

It has surely become clear, that agriculture is too important to be treated as a residual sector. Regardless which strategy a developing country follows, it should not neglect its agriculture sector. Effective ways need to be found to achieve smooth structural transformation and sustainable development. Agriculture holds the potential to not only decisively contribute to economic prosperity, but also food security and health, women empowerment and social inclusion of the marginalized, poverty eradication and an intact environment.

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