

***Agricultural and Rural Transformation in
Ethiopia***

Obstacles, Triggers and Reform Considerations

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Acronyms

mt – metric ton

ha – hectare

hg – hectogram

MOA – Ministry of Agriculture

SDG – Sustainable Development Goals 2030

USD – United States Dollar

1. Introduction¹

We can do anything we want –provided we can find a way. We are constrained by nothing except our own ignorance. Plagues and droughts have no cosmic meaning –but we can eradicate them. Wars are not a necessary evil on the way to a better future –but we can make peace. No paradise awaits us after death –but we can create paradise here on earth and live in it for ever, if we just manage to overcome some technical difficulties.

Yuval Noah Harari, Homo Deus, A Brief History of Tomorrow, 2015: 200

This discussion paper assesses the state of agricultural and rural conditions of Ethiopia; describes the extent, speed and depth of agricultural and rural transformation; and provides policy options for the relevant parties. It is premised on the progress Ethiopia has registered in social, economic and infrastructural development, as well as on policy experimentation over past decades. On average, Ethiopia's economy has been growing at 10% per annum over the past decade. Progress has also been made in expanding rural and urban roads, from 19,000 km of roads in 1990 to 121,171 km in 2019. Ethiopia has also registered a gross educational enrollment ratio of 27.55 million in 2015/16 of which 1.32 million (some 4.8%) graduate each year expecting to join the labor force (MOE 2016). The number of students in various levels of educational establishments is very large, and it is equivalent to, for example, the entire population of Madagascar, or the combined population of Togo, Sierra Leone, Libya and Swaziland. Notwithstanding the continuing need to enhance quality of education, this is a great success story of educational expansion. The vast expansion, however, represents massive demand for jobs across all sectors of the economy.

During the past decades, in aggregate, poverty has declined, in monetary terms, from 45.5% in 1995/96 to 23.5% in 2015/16. By contrast, the multidimensional poverty index² remains at 83.5% with intensity of deprivation at 58.5%, according to the 2019 Human Development report. The share of food in household expenditure has fallen from 60% in 1995/96 to 55% in 2015/16 (the National Planning and Development Commission 2018). The Ministry of

¹ The discussion paper is abridged from the author's book: *Overcoming Agricultural and Food Crises in Ethiopia: Institutional Evolution and the Path to Agricultural Transformation*. The first edition was published in 2018 at the Master Printing, Addis Ababa, Ethiopia, and Amazon, USA 2018. The second edition will be published later this year.

² The Multidimensional Poverty Index (MPI) identifies multiple deprivations at the household and individual level in health, education and standard of living

Agriculture reports³ that agriculture contributes 27.5 billion dollars or 34.1% to the GDP, employs some 79% of the population, accounts for 79% of foreign earnings, and is the major sources of raw material and capital for investment and market. Furthermore, the Ministry plans to increase wheat productivity from 2.7mt/ha in 2019 to 4 mt/ha by 2023 and reduce wheat import from 1.7 million mt in 2019 to zero by 2023. The MOA envisages achieving this by acid soil and vertisol management, intensification, expanded use of irrigation, mechanization, and private sector partnership.

Meanwhile, Ethiopia's population is estimated at 113.56 million accounting for 1.47% of the world population; it now ranks number 12 in the list of countries by population, according to an online Worldometers world population data. The population under the age of 29 years accounts for 69% or 76 million people with median age of 18.8 years, and 23.2 million people (21.1%) urban population. It is expected to increase by 1.9% per year reaching 136 million people in 2030. During the same period, the economy is forecast to grow, on average, by around 7%.

2. Challenges of Agricultural and Rural Transformation in Ethiopia

2.1. A Brief Overview of Ethiopian Agricultural Policies and Programs

Ethiopia's agricultural modernization was conceived at the turn of the 20th century by Emperor Menelik II (1889-1913) who had had a voracious appetite for modernization: he initiated modern housing, eucalyptus tree planting to mitigate urban firewood demand, introduced irrigation, built a railway system, and established key ministries including the Ministry of Agriculture. Emperor Haile Selassie I (1930-1974) expanded Menelik's vision of modernization but both emperors were hindered by the lack of organizational, human and other capacities (see Diriba, 2018). It was only from 1960 onwards that modest progress was recorded following the establishment of agricultural high schools and colleges with the support of USAID's Point 4 Program. Subsequently, a series of bilateral and multilateral technical assistance plans were offered to develop agriculture, including the creation of a Comprehensive Agricultural Package Program, the establishment of an Extension Program Implementation Department (EPID) within the Ministry of Agriculture, and other packages. The most ambitious plan to transform Ethiopian agriculture was drawn up in 1967 by

³ MOA 2019: Transforming Ethiopian Agriculture: Power Point Presentation, Briefing for Agricultural Scholar Consultative Forum, April 2019, Addis Ababa.

USAID contracted through the Stanford Research Institute (SRI)⁴. Completed in 1969, the SRI study consisted of eight program areas for transformation; unfortunately, it ran into difficulties over tenure constraints and the ensuing 1974 revolution in Ethiopia.

The revolution and the military government which brought an end to the imperial administration launched a turbulent period (1974-1991) in Ethiopia's contemporary political and economic history. The most consequential action, from the agricultural perspective, was the nationalization of rural lands, ending one of the oldest feudal systems in Africa, if not the world. Overall, however, other policies of the People's Democratic Republic of Ethiopia (PDRE), the Derg regime as it is usually referred to, induced massive poverty and hunger throughout Ethiopia (Diriba, 2018).

The Ethiopian People's Revolutionary Democratic Front (EPRDF)⁵, established itself as the Federal Democratic Republic of Ethiopia (FDRE), came to power in May 1991 and with the peasantry as its principal political ally, it expressly gave priority to the peasant sector of the economy. This was evidenced in the November 1991 Ethiopia's Economic Policy for the Transition Period (EPRD, 1991); the 2001 rolling framework to guide Ethiopia's development plan, the Agricultural Development Led Industrialization (ADLI) policy; and the subsequent Five-year Development plans. These have included: Sustainable Development and Poverty Reduction Program (SDPRP) 2001-2005, inspired by the multilateral Poverty Reduction Strategy spearheaded by the World Bank; the Program for Accelerated and Sustained Development to End Poverty (PASDEP) 2006 to 2010; and the Growth and Transformation Plan (GTP) I (2011 – 2015) and GTP II (2016-2020).

During the initial period and subsequently from 1991 through 2010, the FDRE focused on poverty reduction. It achieved a significant drop in the rate of poverty and the number of hungry (CDRC, 2019). In 2011, the EPRDF articulated its first five-year Growth and Transformation Plan (GTP), and in December 2010 it established the Agricultural Transformation Agency (ATA) to support agricultural transformation.

⁴ The eight program areas were: Program 1 - Farm inputs and agricultural production consisting of farm machinery, feed; Program 2 - Agricultural Package programs; Program 3 – Supplemental irrigation for agricultural production; Program 4 – Agricultural credit; Program 5 – Processing agricultural products; Program 6 – Marketing and export program; Program 7 – Improving agricultural techniques and technology; and Program 8 – Manpower resources for agricultural development including skilled manpower needs, manpower supply and type of training. See http://pdf.usaid.gov/pdf_docs/PNAAK861.pdf

⁵ As this is being prepared, the coalition front has been formed into a single Prosperity Party consisting of three of the four original coalition members as well as extending membership to five other regional parties; the TPLF, the principal founder of the coalition, opted out of the Prosperity Party.

According to the Government's self-assessment of the GTP I performance, "Ethiopia has registered rapid, broad-based and inclusive economic growth that has led to substantial decline in monetary poverty, the proportion of the population living below the national poverty line fell from 38.7% in 2003/4 to 23.4 percent by 2014/2015; real GDP growth rate averaged 10.1 percent, and the share of agriculture and allied activities in the overall GDP declined to nearly 39% by the end of 2014/15. Crop and livestock subsectors accounted for 27.4% and 7.9% of GDP respectively, while the residual was accounted for by forestry and fishing⁶." The Government self-assessment concluded that "*the decline in the share of agriculture is an indication of structural shift from agriculture to industry and service sectors*" (author's emphasis). As noted earlier, the multi-dimensional poverty index reveals a different and often-depressing condition of Ethiopia's population.

Contrary to the Government's declared 'structural shift', Ethiopian agriculture has remained essentially antique and rainfall-dependent, an all-too-obvious reality throughout the country. Rural Ethiopia, a definition that covers the vast majority of the population, is still typified by lack of roads, services, and with only 59.5% population, primarily urban, with access to electricity and even that only intermittent, and 95% of the rural population relying on firewood for cooking, heating and lighting. There is no evidence of agricultural transformation, nor has there been evidence of sizeable expansion in the manufacturing sector commensurate with the vision of the ADLI. By the end of the GTPI, the government recognized that despite the progress made in a number of sectoral areas, one fourth of the population still lived below the poverty line, that is in monetary measure; urban and rural unemployment remained very high, and the agricultural sector remained dependent on rainfall using traditional methods with minimal application of modern agricultural inputs. In an after-thought, the government admitted that 'there has been limitation in terms of structural change'. In effect, there had been no structural change at all.

The GTP II period (2016-2020) has coincided with a turbulent political period, starting after the May 2015 election and continuing to the present time with political turmoil displacing large segments of the population. As a result of changes in the ruling coalition, the EPRDF government leadership, and the launching of extensive reform processes, GTP II performance is expected to be below expectation. Government estimates suggest that GDP growth rates for 2018 would be around 7% with further reduction in growth in all sectors. The expectations for agriculture's growth have been lowered to 4.1%, though the long-term growth rate is far below this.

⁶ See GTP II introduction section which assesses GTP I performance.

The EPRDF government has also experimented with a number of policies and programs, expanding organizational outreach to the rural population, and, as we will see, has been able to register quantitative crop production increases, especially in cereal crop production and productivity. The categorization of chronically food insecure population into a Productive Safety Net Program (PSNP) has created a formalized welfare assistance program, but this requires continued international assistance that the prevailing Ethiopian economy cannot sustain without foreign aid. Despite these modest efforts, Ethiopia has not managed to start any multi-sectoral structural transformation nor has it been able to put agriculture on the path of transformation.

2.2. Obstacles to Agricultural and Rural Transformation in Ethiopia

Ethiopia's agriculture has shown remarkable resilience over many centuries but is now increasingly failing. This was demonstrated by the remarkable way it has sustained a steadily increasing Ethiopian population with millennia-old tools and systems of production. Ethiopia is one of the original centers for crop and livestock domestication that started during the Neolithic revolution ten thousand years ago. Since then, Ethiopian farmers have continued to utilize their ancient system of production despite changing ecological and population pressures, feeding, if with difficulty, Ethiopia's growing population into the 21st century with their generationally acquired wisdom and skills. Equally, Ethiopian agriculture is increasingly failing as farmers work to expand agricultural lands at a great cost to the environment and the delicate ecological system, thereby risking the very fabric of their own livelihood. Systemic obstacles to agricultural and rural transformation in Ethiopia can be summarized as lack of sustained and intergenerational commitments to transformation, constitutional and legal constraints, government crowding out the private sector leadership, lack of mechanization options and constrained input supply system, lack of effective and accountable organizational capacity, lack of agricultural and rural financial and credit facilities and environmental degradation (see Figure 6, Box 1). Ethiopia's institutions have refused to recognize the devastating impact of technologically-lagging agriculture despite awareness of the 4th industrial revolution that would have relieved pressure on the land and offered a respite from the numerous dimensions of food insecurity.

The Rising Tide of Hunger and Poverty

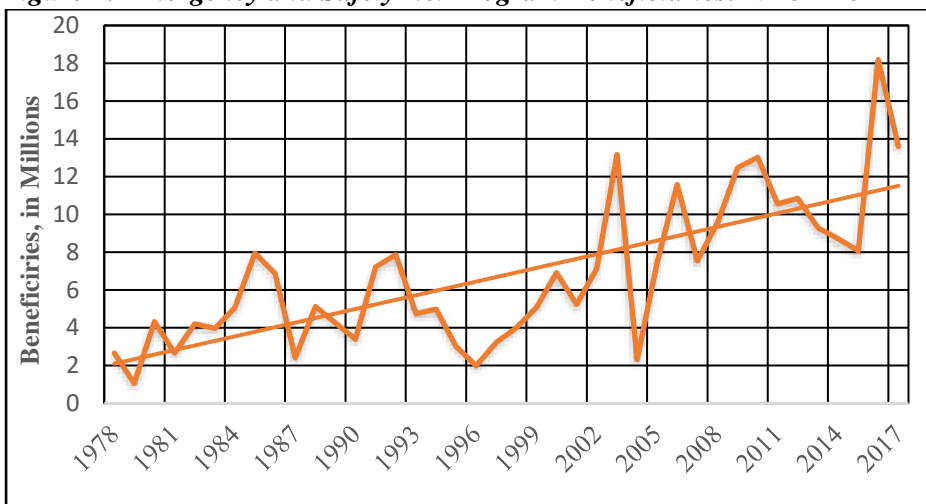
It is almost unbelievable that policymakers, scholars and practitioners, with knowledge about the most advanced technologies in the world, failed to anticipate the problems of food security and agricultural development before they

unfolded. They failed to recognize the seriousness of the danger even when the problems had actually revealed themselves; and they failed to take decisive and bold action after the problems appeared at national level, along with human, environmental, economic and political consequences. It demonstrated a real crisis of vision, a total failure of understanding, naïvely assuming Ethiopia's agriculture could continue essentially in its present form and shape.

To be fair, and as briefly introduced above, Ethiopia has been tinkering with the concept of agricultural and economy-wide 'modernization' since the turn of the 20th century with limited success. Since 2000, efforts have been made to develop infrastructural expansion - roads, educational facilities, housing construction in major urban centers, hydro-electric generation plants, modest expansion in manufacturing and service industries – though the emphasis has been concentrated in Addis Ababa, the federal capital, and a few other regional State capitals. Efforts to develop agriculture have also brought about a modest quantitative growth, especially in cereal crop productivity per unit area. These efforts have resulted in nearly two decades of 10% GDP growth, and the reduction of income poverty from 45% in 1995 to 23% in 2018. While this might appear impressive, the number of poor and food insecure population has remained very high, with an estimated 25 million people at or below the threshold of survival. And more specifically, the numbers of people on emergency and safety net program assistance have been consistently increasing (Figure 1) over the past 40 years, 1978-2017. Not only has the aggregate number of people depending on welfare assistance increased, there has also been a steady expansion in spatial manifestations, now covering nearly all the Regional States. This is an underlying trend that should alarm policymakers and development practitioners alike.

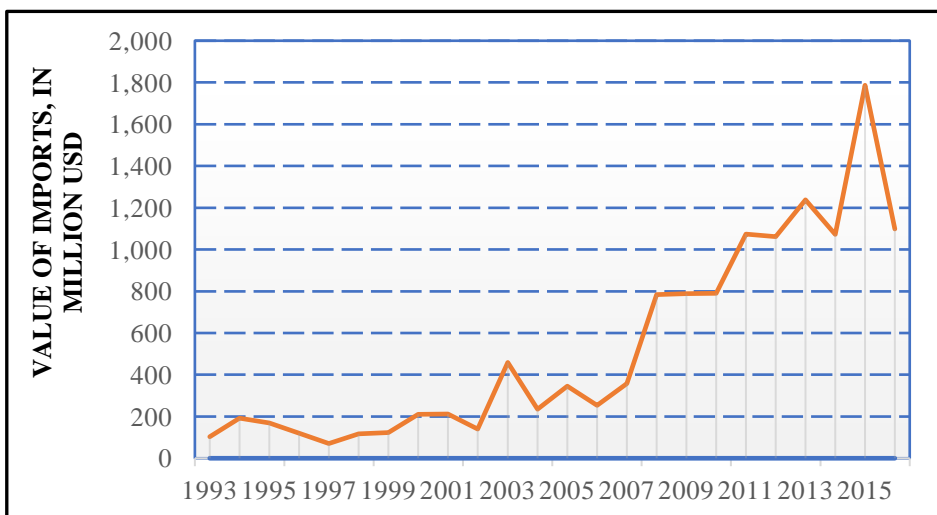
In addition, Ethiopia's import of cereals (wheat, rice, barley), edible oil and lint cotton, continues to rise dramatically, now costing over a billion dollars every year (Figure 2). Given the foreign currency constraints the country is grappling with, it is disconcerting to witness growing import demands for products that could easily be home grown.

Figure 1: Emergency and Safety Net Program Beneficiaries: 1978 – 2017



Source: Author, based on the NDRMC and MOA data.

Figure 2: Value of Imported Cereals, Dairy Products, Edible Oil and Cotton, 1993- 2016 (USD)



Source: Author, based on the FAOSTAT data.

The paradox is clear. At one level, there is a story that offers successful production and productivity increases amongst (some) progressive farmers in Arsi, Bale, part of Showa, parts of Tigray and Somali regional states and other areas. They have invested their resources to ‘acquire’ agricultural lands, employ tractors and harvesters, and optimized the use of agricultural inputs. They have succeeded in

increasing land and labor productivity. They have successfully improved their lives and livelihoods. It is, however, a ‘success story’ that demonstrates the potential of Ethiopian agriculture- if conditions are right. This is no more than a partial ‘success story’, and represents no more than a tiny proportion of farm households which built on the historical opportunities of rural development projects of the 1960/70s. At another level, Ethiopia is desperate to export agricultural commodities to earn foreign currency that are in critical demand even when some of the export commodities are not competitive regionally and internationally. Most agricultural commodities are exported without value addition (for example, sesame seeds or other pulse crops, and live animals).

Input and Output Price Constraints

Smallholder farmers are faced with input and output price constraints: imported cereals are sold at subsidized prices to ‘stabilize local grain prices’, and food aid deliveries dampen local grain prices. Delayed delivery of agricultural inputs, absence of credit markets, and lack of access to agricultural technology are the hallmark of Ethiopia’s agriculture in the 21st century.

At the most fundamental level, Ethiopia’s problem has been the way it has ignored the scientific progress that has provided economic and social solutions, eased human hardships from want of food, improved and accelerated transportation, invented tractors and harvesters that have eliminated the need to depend on the backbreaking antique farming methods and making agriculture work easier and more enjoyable. The traditional factors of production, land, labor and capital, have now been merged with the knowledge system. The real difference between the rich and poor countries is no longer only endowment of the factors of production as it used to be; rather it is how effectively nations and people utilize knowledge. Knowledge, that is scientific invention, technology, innovation, and the internet, are all growing at an accelerated rate leaving far behind countries such as Ethiopia. As Harari (2015: 212) points out, “the greatest scientific discovery was the discovery of ignorance. Once humans realized how little they knew about the world, they suddenly had a very good reason to seek new knowledge, which opened up the scientific road to progress. ... Inventions such as the steam engine, the internal combustion engine and the computer have created whole new industries from scratch. As we look twenty years into the future, we confidently expect to produce and consume far more in 2036 than we do today.”

The other side of the story is one of stagnation and decline. The vast majority of smallholder farmers live in perpetually substandard conditions, relying on traditional systems, unable to meet food consumption needs and other demands at the most basic level. Their farms are severely undercapitalized, they

work on fragmented and declining landholdings, facing severe and chronic food insecurity, unable to invest in agricultural inputs (chemical fertilizer, improved seeds), or withstand seasonal risks of crop failure or animal deaths. They face continuous poverty and hopelessness. Many are now forced to rely on welfare assistance and depend on imported cereals (Figures 1 and 2).

The most persistent obstacle to Ethiopia's agricultural and rural transformation is insufficient appreciation of the magnitude of the danger or of the consequences of the steadily increasing problems of agricultural and rural areas (see Figure 6, Box 1). As already indicated, there has been a total lack of intergenerational leadership recognizing the limits of the traditional techniques of farming, the pitiful living conditions of the vast majority of rural populations near or below subsistence and participating in agricultural practices that lead to extreme environmental and natural resource degradation. This does not mean that these problems are unknown - they are after all in the public domain. Numerous studies have provided detailed analyses of 'systemic bottlenecks' in agriculture (see ATA 2014). These have been repeatedly expressed in terms of delayed agricultural input deliveries, lack of access to agricultural machinery, absence of financial services, poor agricultural extension systems, incoherent national agricultural research systems, uncoordinated seed systems, and many other challenges (FAO 1986, 2018, 2019, ATA 2013-2016, Diriba 2018, UNIDO 2013, ILRI 2017, and numerous other studies and project appraisal reports).

A WIDE⁷ study reveals changes taking place in rural Ethiopia: "... increasing divisions and inequalities and disrupted long-standing relationships between social categories: between the rich and the poor, between those with access to land and/or capital and those with too little or none, and, in different respects, between generations and gender. There are also growing disparities between better connected and less well-connected communities, and between areas and households within communities that are close or further from roads and urban centers. in much of the country and four bridge communities, the difference between being landless, having a quarter of half a hectare or more than one and, for the few who are better off, two hectares or more, can mean the difference being destitute, barely surviving, managing an independent livelihood or thriving and being part of the wealthy elites" (Pankhurst and Dom, 2019: 13 - 16).

Ever since the problems of agriculture and rural areas began to become visible at the national level, Ethiopia's leaders including relevant players in the sector appear to have been preoccupied with other issues, making no more than short-term responses for agricultural development and neglecting any radically

⁷ WIDE – Wellbeing Illbeing Dynamics in Ethiopia - is an ongoing longitudinal study of 20 rural communities in Ethiopia since the mid-1990s.

different possibilities. There has been a recurrent crisis of vision. The issue has been clear enough: the prevailing systems of agricultural production have produced numerous fissures and concerns for the environment, for human wellbeing and for the national economy. It is a commonplace that some 20 million or more people live in a chronic state of food deprivation at the most basic level; more than 7.8 million are recipient of permanent welfare assistance under the Productive Safety Net Program. These figures are steadily increasing both in number and in area. Every year, another 3 to 5 million people have to be assisted with emergency humanitarian food aid programs; the numbers that constantly face risks and vulnerabilities are more numerous than the PSNP and emergency assisted population combined. The cost of hunger and poverty remains exceptionally severe for the economy and the population. A Cost of Hunger Study (AU/WFP/ECA 2013) estimated that hunger cost Ethiopia \$2.9 billion USD, equivalent to 16.5% of GDP. This is expressed in lost productivity, poor educational performance, healthcare and related expenditures; the environmental and political costs of hunger, including social unrest, were barely documented in financial terms. All this has increased in the last six years; and there has to be a limit to Ethiopia's costly neglect of agricultural and rural transformation.

Property Right Dilemma

Another critical obstacle to agricultural and rural transformation is legal and constitutional, that is the prevailing property rights that have produced land fragmentation, persistently declining land per capita, and an increasingly landless population. Legally, the constitutionally sanctioned 'public land ownership' provides farmers with formidable challenges: land fragmentation, land shortage, the lack of capacity to capitalize land, and environmental degradation on a massive scale. Official data on landholding presented in Table 1 shows that 38% of households access less than 0.5 hectares of land, 23.65% access between 0.51 to 1.0 hectares, 24% between 1 and 2 hectares, and that only the remaining 14% of households access more than 2 hectares of land. At present productivity levels, it is only those households which farm more than two hectares of land which can achieve basic subsistence under normal conditions. Households with less than one hectare of land are often unable to fulfill household needs including necessary food consumption at the most basic level. The problem of size is not just the inability to produce enough crops to meet consumption, it also means it is impossible to save and create wealth. The persistent decline in the size of farmland also represents a formidable challenge in applying mechanized farming or of obtaining long-term capital investment on land.

Ethiopia's agricultural organizations and multiplicity of actors are disorganized and incoherent in their approach to the technological challenges. Political authorities, development practitioners, researchers, technologists,

businesses, and entrepreneurs offer no system of coordination and collaboration to help deal with the massive obstacles facing farmers. Ignoring the conditions facing the vast majority of Ethiopia's smallholder farmers is more than merely reckless; it has serious human, environmental, and political costs.

As Table 1 shows, land shortage is chronic in most parts of the country with resulting severe degradation of soil and forest resources. In response, the Ethiopian government encourages farmers to employ 'clustering/ communal farming' by adjoining adjacent plots (kuta-getem - ኩታገጠም እርሻ) to help improve productivity. 'Clustering farming' may have an appearance of offering respite; however, it is impractical, does not resolve the underlying structural and legal constraints to property rights and the desire to consolidate land, nor does it result in any decisive increase in income, and or labor productivity frontiers.

Table 1: Number of Holders by Land size (ha) - 2014/2015

Regional States	< 0.1	0.1 – 0.5	0.51 – 1.0	1.01 – 2.0	2.01 – 5.0	5.01- 10.0	> 10	Total	% share
Tigray	61,989	242,870	245,102	256,116	120,235	7,908	1,158	935,378	5.51
Afar	479	4,124	2,683	1,717	416			9,419	0.06
Amhara	315,832	924,145	1,089,212	1,423,634	718,963	35,558	2,033	4,509,377	26.57
Oromia	295,494	1,376,669	1,516,824	1,772,376	1,169,506	143,707	7,483	6,282,059	37.01
Somali		21,695	21,991	27,893	16,525	1,623		89,727	0.53
Benishangul Gumuz	27,008	55,186	46,041	47,057	37,393	5,958	1,172	219,815	1.29
SNNP	595,716	2,477,863	1,067,941	539,482	147,127	9,187	1,681	4,838,997	28.51
Gambela	9,184	20,227	7,399	3,931	1,190			41,931	0.25
Harari	1,328	9,309	8,239	5,167	989			5,032	0.15
Dire Dawa	646	9,033	9,345	3,772				22,796	0.13
Federal	1,307,676	5,141,121	4,014,777	4,081,145	2,212,344	203,941	13,527	16,974,531	100.00
%age	7.70	30.29	23.65	24.04	13.03	1.20	0.08	100.00	

Source: Based on CSA data

Organizational Inefficiencies and Incoherence

Where there has been some effort to respond to organizational challenges, in the form of policies or programs, these have repeatedly imposed taxes and duties, been characterized by input delivery inefficiencies arising from inaccurate and/or delayed demand estimates and delayed distribution to households, especially of chemical fertilizers, pesticides, and herbicides. It has all helped to make prices of agricultural inputs and machinery unaffordable. As of May 2019, some import duties were being lifted but full benefits of tax exemptions to smallholders have yet to be realized, especially in absence of rural and agricultural banks and credit facilities.

Another dimension of any response to organizational challenge has been the lack of priority access to foreign currencies to import agricultural inputs and machinery, creating a vicious cycle. The shortages resulting from the lack of agricultural development have forced the government to import wheat and vegetable oils to meet deficits in national demand which might otherwise bring bread riots or a similarly historical troublesome situation. With credits and financial services limited, and largely inaccessible to the vast majority of the farming population, the slow pace of agricultural services has retarded development in agriculture, and indeed in other sectors of the economy, perpetuating hunger and poverty and risking political unrest.

No formally dedicated organization, public or private sector, has been set up to supply tractors, harvesters, water drilling machines, agro-processing and other machinery, suggesting a troubling complacency among all actors about the traditional system of agricultural production. Despite the activities of the Ministry of Agriculture, the Agricultural Transformation Agency (ATA) or the Ethiopian Agricultural Business Corporation (EABC), there is no single organization that is directly responsible for, or dedicated to, support agricultural mechanization, or indeed rural transformation. Bizarre as it may sound; Ethiopia seems to have accepted its traditional system of agricultural production as the best available. Ethiopia's leaders and practitioners in agriculture are certainly aware of highly advanced agricultural technologies. This raises broader political and policy questions as to why they are not seeking all ways to introduce and support the adoption of mechanization in agriculture. As we have emphasized, one does not need an extended statistical analysis nor elaborate data collection to establish that Ethiopia's agriculture is very old, relies on ox plow and rain-dependent techniques and has a negligible rate of mechanization. It is, in fact, an open museum of the Neolithic age. According to a recent study, the rate of mechanization in agriculture in Ethiopia is estimated at 0.7% of land prepared by machine with no more 0.8% crops threshed by machine. Even these are only

confined to areas of Arsi, Bale, Western Tigray and parts of Somali region (IFPRI, 2017)⁸.

The traditional systems of crop and livestock production may have served the nation for millennia but this was only with a smaller population and a largely unaffected environmental system. Today, the same traditional tools and activities are expected to cultivate extensive areas and feed over 100 million people. This is not only impractical, but it is also inducing human and environmental disaster. To continue to rely on the ard plow, or partial application of agricultural inputs, is simply inadequate to meet expectations of agricultural productivity or improvements in human condition. As a result of the absence of mechanization, labor productivity has remained exceptionally low, even in comparison to other developing economies. At best, household labor productivity, outside coffee or cash crop growing areas, amounts to 1,750 kg of cereal for cereal-dependent populations on an average 0.65 ha of land. In addition, youth unemployment has become a major political and policy challenge for both the Federal Government and the Regional States. Data on migration is hard to obtain, but it can be inferred from both pull and push factors at work in Ethiopia. On the one hand, declining land availability and absence of employment opportunities in rural area are pushing the youth to urban centers; on the other hand, government authorities, fearful of political implications, offer ‘promises of job creation’ pulling large numbers of rural youth into major urban centers, especially Addis Ababa. The significantly expanded primary, secondary and tertiary education levels are also creating extensive unmet job expectations outside the agricultural sector and rural areas. The educational system is not producing or encouraging talent and skills that help or prepare graduates to create jobs, nor is there sufficient private sector capacity to employ the tens of thousands of job seekers entering the labor market each year.

Fearful of the Creative Destruction

There is insufficient appreciation of the potential of a rural and agricultural transformation to generate employment on a sustainable and continual basis. This would include mechanized small, medium and large-scale farmers, tractor and combine harvester operators, rural transport operators, machinery repair technicians, agricultural extension officers, veterinary specialists, plant protection specialists, and other service providers. These services could be linked to rural urbanization, decentralized manufacturing and services. That is, when agriculture and rural economies are transformed, the role

⁸<http://essp.ifpri.info/2017/02/28/the-rapid-uptake-of-agricultural-mechanization-in-ethiopia-patterns-implications-and-challenges/>, accessed May 2019.

of agriculture is elevated, not diminished, taking the commanding role in the Ethiopian economy and national security. With the transformation of agriculture, and the factor of productivity being dramatically increased, agriculture would release surplus labor that would be transferred to agricultural product processing (such as cotton, oil presses, fruits and vegetable processing, food processing and packaging, food processing including sucrose extraction and others), transporting, trading, food catering and distribution (in small shops, hotels, restaurants, and others), storage, and add value and expanded services at different stages. For the foreseeable future, on the basis of Ethiopia's economy today, the dream of establishing heavy industries (for example, steel smelting or automatic manufacturing) is likely to be distant. Even if they were realized, agriculture would still remain the commanding height. A strategic linkage among the agriculture, manufacturing and service sectors and urbanization would offer extensive and inclusive development opportunities at scale and at speed. These actions would, however, require intergenerational political commitment, coherent policies, balanced investments across all sectors of the economy, and willingness to accept the forces of creative destruction.

The growing food deficit in the national food balance sheet, the increasing importation of cereals and vegetable oils, the continued and expanding food aid flows, the appearance of a chronic food insecure population, with large segments of the population living below the internationally determined poverty line, have all been accepted as 'normal'. Even as the international systems celebrate the avoidance of 'famine', that is absence of 'mass starvation' (de Waal 2018), existing conditions signal massive problems for the population, the environment and the national economy.

Continuation of the present system of agriculture will mean that food and other needs of the rural and urban poor have to be provided by the government and international charities. The Ethiopian economy cannot fully finance the number of the welfare dependent population, nor is feasible to expect indefinite foreign welfare assistance. Yet, despite all this, at the international level, Ethiopia is committed to achieving the Sustainable Development Goals (SDG), which encapsulates "a plan of action for people, planet and prosperity. SDGs recognize that eradicating poverty in all its forms and dimensions is the greatest global challenge and an indispensable requirement for sustainable development. It is a universal resolve to free the human race from the tyranny of poverty and want and to heal and secure our planet. The 17 SDGs are integrated and indivisible and balance the three dimensions of sustainable development: the economic, social and environmental."United Nations, the 2030 Agenda for Sustainable Development, 2015.

2.3. The Agriculture and the Environment Nexus

The most comprehensive review of the state of Ethiopia's environment, its land, vegetation, forests, soils, water, and population was conducted by the

FAO and the Ethiopian government in 1986 under the auspices of the Ethiopian Highlands Reclamation Study. The study, completed more than three decades ago, concluded that the increase in population had extended farming to increasingly vulnerable land areas and reduced available fallow periods. In fact, feudal and other forms of dependent land tenure, coupled with day-to-day preoccupations with survival, had, over the centuries, led the growing highland population to farm the land in ways inappropriate to its sustained use. This had inevitably led to land degradation, typified by excessive deforestation and soil erosion, and by worsening water storage and flow regimes, and reduced the potential productivity of land. It had become a spiral of degradation. The study estimated that over 1900 million tons of soil were lost from the highlands of Ethiopia annually. These were losses of productive top soil and for all practical purposes irreversible as it takes many years to generate a ton of top soil. Soil erosion was gradually undermining the natural agricultural heritage of the country, and as a result, the highlands of Ethiopia contained one of the largest areas of ecological degradation in Africa, if not in the world. Environmental conditions had worsened to such an extent that in some parts of the highlands, millions were now scarcely able to subsist even in years of good rainfall while years of poor rainfall threatened famines of increasing severity and extent. Other highland areas were being gradually degraded, and it was only a question of time before the degradation spiral threatened livelihoods in all these areas too. This process of degradation threatened millions of Ethiopians then and even more in the future. It posed the greatest long-term threat to human survival, and the greatest challenges facing the Ethiopian people and Government.

These prognoses could hardly have been more apt drawing attention to urgent action. And since the study was conducted, Ethiopia's population has increased 2.6-fold putting massive pressure on the already degraded lands. No other in-depth study has been conducted, but it is quite evident that the situation of most watersheds and their surroundings have moved far beyond the picture painted more than three decades ago. There has been continued expansion of agriculture into marginal and high-risk areas, seriously increasing land fragmentation, declining land use per capita and a significant increase in virtual landlessness. There has, in effect, been no effort to reverse the dangerous trends observed thirty years ago. Outside of the highland areas, in pastoral and agro-pastoral areas of the country, an equally dangerous environmental deterioration is at work. Despite data scarcity, it is evident that crop production has expanded into the pastoral and agro-pastoral zones creating a perfect storm for environmental deterioration on the one hand, and conflict between livestock and crop production on the other.

2.4. Agricultural Growth without Transformation

In this section, we will review the performance of the agricultural sector, cereal crops, pulses, oilseeds and the livestock components.

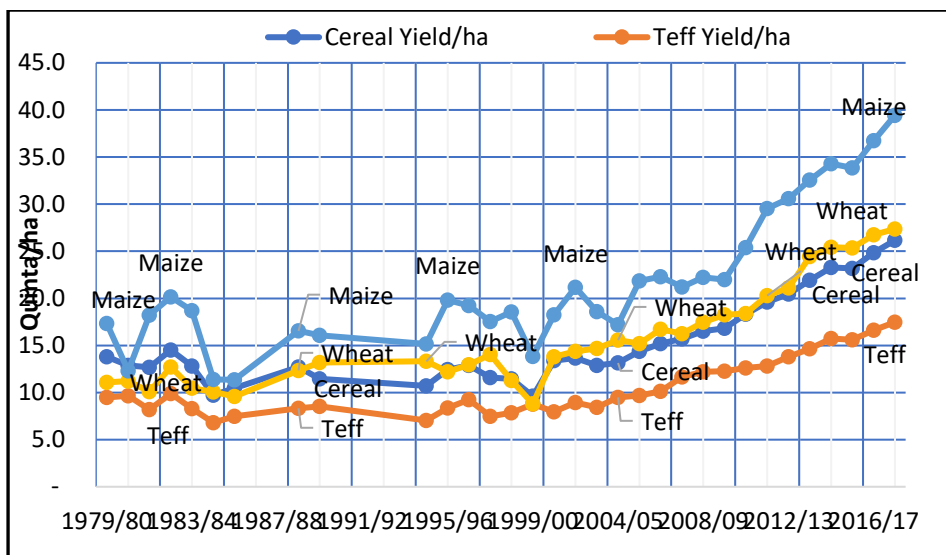
The Crop Sub-sector

Time series data is used here to examine performance and trends in crop production. This covers area cultivated, total production and yield per hectare from 1979/80 through 2017/18, over a period of 38 years. It is important to take a long-term trend because changes in the national economy such as crop performance only reveal themselves in time, and long-term data smooths out short-run fluctuations. During this period, as would be expected, aggregate national cereal production has increased considerably, by 4.2-fold, reflecting increases in the number of farming households, expanded area under crop cultivation, and utilization of chemical fertilizers, pesticides, and herbicides as well as other farm management practices. In spite of these quantitative increases, however, rural life has remained harsh, and production systems have continued to use antique techniques. Ethiopia's overall agricultural performance can be characterized as growth without structural transformation.

During this period, as depicted in Figure 3, the area under cereal crops grew at a rate of 2.13% per year, while yield increased at a rate of 1.7%, and cereal production grew by 3.87% per annum. Cereal yields increased from 1,379 kg/ha to 2,617 kg/ha in 2017/18, nearly double the productivity level of 1979/80 (Figure 3). Ethiopia's cereal productivity of 2,617 kg/ha is far below 7,230 kg/ha in Egypt and 5,886 kg/ha in China (using FAO production data for 2017), indicating Ethiopia's potential opportunity to expand production and productivity frontiers by more than double or triple its current levels.

The quantitative growth achievements in crop production are due to national efforts to increase cereal production to ameliorate national and household food deficits which would otherwise have spun out of control. This growth, however, came from the expanded area under cultivation, increases in the number of households participating in agriculture, and the use of chemical fertilizer and seeds. And any food security and national wellbeing implications of this supply side growth must also be considered in relation to the five key agriculture performance indicators: meeting consumption needs, meeting local and social obligations, investment in agriculture and replacement of tools, capacity to mitigate risk, and creation of wealth.

Figure 3: Selected Crop Yield/ha: 1979/80 - 2017/2018



Source: Author, based on the CSA data.

Principal cereal crop performance is highlighted below:

Teff: Consists of the largest area cultivated under all cereals, accounting for 29.5% of the total cultivated area and 19.7% of total cereal production. This area allocated to teff production is indicative of the high price of teff which fetches more than double the price of wheat and many times more for other cereal crops. It is the national food preference, especially among the middle class, and provides for the growing export market. The area under teff cultivation has been growing at a rate of 2% per annum; its total production has been growing at a rate of 3.65% though yields have only grown at a rate of 1.62% per annum over the past 38 years.

Maize: The area dedicated to maize production is the second largest, 20.8% of total cereal area with production accounting for 31.4% of total cereal output; nearly one third of cereal production in Ethiopia is maize. In terms of the volume of production, maize has the most impact on the national food equation, at least among the general population. Over the years, the area under maize cultivation has grown at 2.76% per annum, production by 5.0% and yield by 2.19%.

Sorghum: This accounts for 18.5% area under cereals and 19.3% of total cereal output. The area under sorghum has grown at an annual rate of 1.71%, total production at 3.11%, and yield by 1.37% per annum.

Wheat: Accounts for 16.6% of the area under cereal cultivation and 17.3% of total cereal production. The area for wheat has grown at 3.69% per annum, total

wheat production⁹ at 6.18% and yield has remained at 2.4% per annum during the same period. Wheat is milled into flour for traditional bread, and use in bakeries, for pastries and pasta as well as being mixed with other cereals to make *enjera*. The growing number of milling companies in and around Addis Ababa, and in Arsi, Shewa and other regions, is a testimony of the growing demand for wheat. In addition, a significant quantity of wheat is imported each year to supply the national shortfall, accounting for 9% of national total cereal production (see Diriba 2018).

Barley: Accounts for 9.3% of total cereal area and 7.7% of total cereal production. The area under barley has grown at a rate of 0.57%, total production by 2.19% and yield by 1.62% per annum.

Pulse Crop Production

Ethiopia has a rich heritage of pulses and oilseeds being one of the centers of origin of these crops. They represent the most important dietary composition of households, and are a major contributor to export earnings. Nevertheless, national policy and program priorities have not been commensurate with the importance of the pulses and oilseeds domestically or as export earners. Total pulse crop production grew at 2.75%, area at 1.56% and yields at 1.17% per annum between 1979/80 to 2017/18 (Figure 4).

Faba beans: Account for 29.8% of area and 33.2% of total pulse production in 2017/18. Annual growth has been 0.89% for area, 1.73% for production and 0.89% for yield over 38 years.

Haricot beans: Account for 20.8% area and 18.8% of production during the same period. Growth rate of area has been 7.7%, production at 8.28% and yield at 0.54% since 1979/80, indicating that most of the production increases have been due to area expansion.

Chick pea: 16.5% of area and 18% of total production. Growth rates have been 1.02% for area, production 3.24%, and yield at 2.19%.

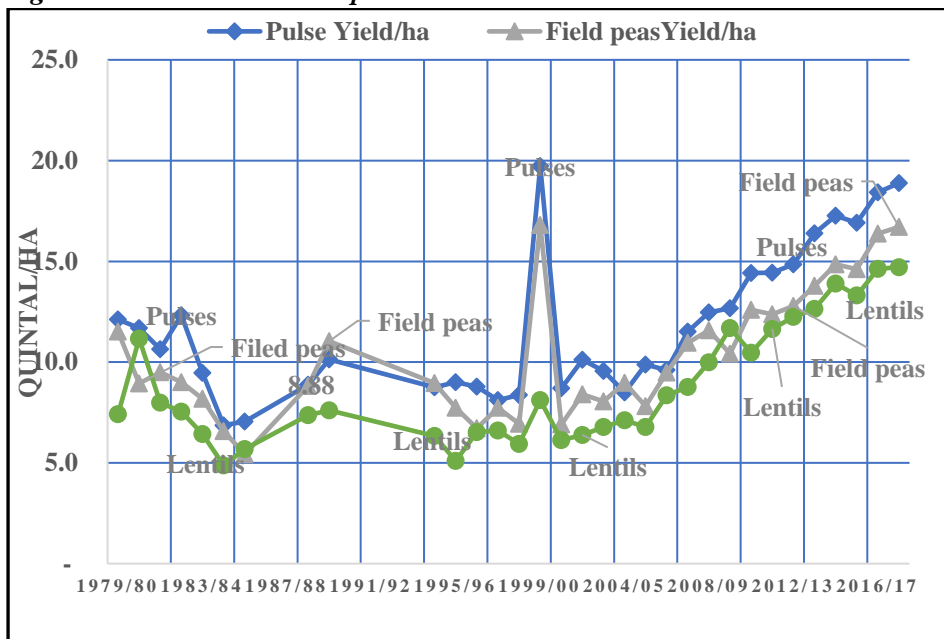
Grass pea: 9.7% of area and 10.3% of total pulse production output. Growth rates have been 1.74% for area, production 3.59% and yield 1.82% during the 38 years.

Lentils: 8.1% of area and 6.3% of total pulse production. Area, production and yield growth rates has been 2.89%, 4.76% and 1.82%, respectively.

⁹ It is estimated that only 70-73% total volume of wheat enters consumption with 27-30% affected by impurities. These include desiccated grains, damaged grains by pests, grains in which the germ is discolored, sprouted grains, miscellaneous impurities such as extraneous seeds, extraneous matter, husks, ergots, decayed grains, dead insects, and other undesirable material.

In sum, Ethiopia has the potential to substantially increase pulse crop yields, and even in some cases at least double current yields.

Figure 4: Selected Pulse Crop Yield/ha: 1979/80 - 2017/18



Source: Author, based on the CSA data.

Oilseeds production (Graph 6)

Sesame: 39.4% of total area and 23.2% of the production of oilseeds. The area under sesame grew at 15.34%, production at 18.48% and yield at 2.72%.

Neug (Niger seed): 31.1% of the total area dedicated to oilseeds and 29.3% of total production in 2017/18. Growth rates have been 2.62%, production 5.15% and yield 2.47% per annum.

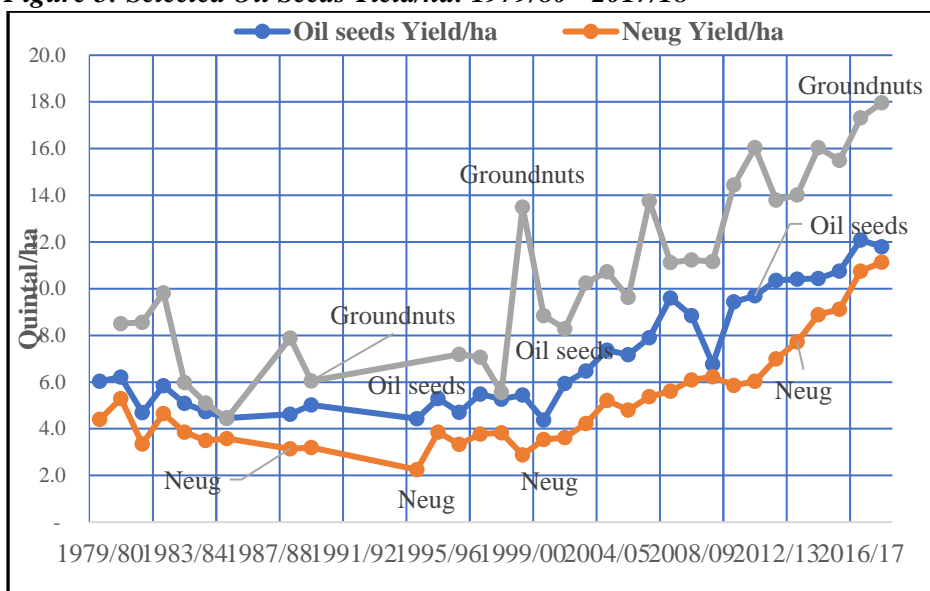
Groundnuts (peanuts): 8.6% of area and 13.2% of total oilseeds production. Growth rates have been 11.22% for area, production 13.49% and yield 2.04%.

Linseed (flax): 8.5% of area and 8.0% of production. The area grew at 1.71%, production at 3.87% and yield at 2.12%.

Fenugreek: 3.5% area and 4.0% of total output of oilseeds. Area grew at a rate of 3.77%, production at 8.05% and yield at 4.12% per annum.

Rapeseed accounts for 1.9% of area and 3% of oilseed production. Area grew at a rate of 0.52%, production at 2.2% and yield 1.67%

Figure 5: Selected Oil Seeds Yield/ha: 1979/80 - 2017/18



Source: Author, based on the CSA data.

The Livestock Sub-sector

The Ethiopian livestock sector is even more traditional than the crop subsector. Ownership and spatial distribution of livestock resources among the crop growing and pastoral areas is presented in Tables 2 and 3, respectively. Within the crop growing area, 3.7 million households (29.16%) are without cattle holdings, while over 11 million households (92.7% of cattle owning households) own between 1 to 9 head of cattle. In regional distribution, the Oromia State has the largest number (4.7 million cattle), followed by the Amhara State (3.8 million) and the SNNP Regional State (2.8 million). In terms of the equine population, a few Regional States stand out: a) Donkeys: Amhara State 1.878 million; Oromia 1.988 million; Tigray 521,928 and Gambela 496,226 account for 95.7% of the national donkey total. b) Horses: Tigray 2,983, Amhara 299,890 and Oromia 722,377.

Livestock resource distribution in pastoral area is presented in Table 3. Pastoral area accounts for 14% total cattle population, 19% sheep and 35% goats. This shows that 86% of cattle population is located in cereal producing areas with greater competition between crop and livestock over grazing and farm lands. The geographical concentration and specialization of animal resources is an important context for any livestock sector transformation agenda as shown in Tables 2 and 3).

As Table 4 shows, there is a considerable livestock resource in Ethiopia disaggregated by regional States and combining livestock resources in crop growing, pastoral and agro-pastoral areas. There are more than 56.7 million cattle, 29.3 million sheep and 29.1 million goats. The potential to transform the sector as an economic engine for households and the nation is huge.

There have been a number of recent studies recommending modernization options for the livestock sub-sector (UNIDO 2013, ILRI 2017, FAO 2018/2019). The UNIDO study indicates that milk production in Ethiopia has remained relatively low in terms of productivity: 2,160 Hg/annum for an average cow milk, for the years 2000 - 2010 in Ethiopia; this compares with Kenya (5,500 Hg/An), Egypt (14,500 Hg/An) and South Africa (32,700 Hg/An), suggesting Ethiopia has considerable potential to increase milk production. Currently, 90% of milk production in Ethiopia is undertaken by smallholder farmers, depending almost entirely on natural grazing and most of the milk produced retained for household consumption. Another problem is the largely informal distribution and marketing system for milk and dairy products. There is only a limited formal commercial system in operation. This is characterized by the absence of licensing requirements, lack of regulation, low cost of operation and high producer price when compared to the formal market. The traditional processing and marketing of dairy products, especially of traditional soured butter, dominates the Ethiopian dairy sector, and the traditional, unreliable and unhygienic, processing methods contribute to poor product quality. The lack of chilling and cooling facilities during milk collection leads to deterioration of milk quality and high losses. Within the commercial sub-sector, problems of unreliable supply and the high cost of packaging materials continue to limit investment in processing and packaging technology. Most of the existing processing facilities lack state-of-the-art technology for manufacture of value-added dairy products such as UHT, yoghurt or ice-cream.

The UNIDO study also notes that despite the large number of dairy cows, both the volume and value of Ethiopian dairy exports remains low. Butter is exported to only a small number of countries including Djibouti, Somalia and South Africa and to the Ethiopian diaspora. The import of dairy products varies considerably year to year, but the value of imported dairy products is substantial enough to lead to a negative net trade balance, ranging from US\$ 5 million in 2007 to US\$16 million in 2010.

Table 2: Cattle Holding Size in Main Crop Growing Areas by Region, 2014-2015

Regions	Number of Households by Cattle Holding Size								total Owners
	not owners	1-2 Head	3-4 Head	5-9 Head	10-19 Head	20-49 Head	50-99 Head	100-199 Head	
Tigray	287,353	263,330	335,260	267,238	70,967	13,729	1,481	103	952,108
Afar	87,705	29,204	32,232	52,270	38,498	15,908	2,941		171,053
Amhara	1,003,187	1,387,062	1,349,692	953,993	132,376	11,283	1,389		3,835,795
Oromia	1,355,894	1,455,720	1,368,273	1,423,287	419,686	57,115	2,371	144	4,726,596
Somali	48,097	23,708	26,888	31,019	14,750	4,041	196		100,602
Benishangul-Gumuz	127,592	32,028	26,625	30,093	13,925	4,754	161		107,586
SNNP	772,980	1,105,073	979,778	634,189	90,814	22,156	4,574	1,339	2,837,923
Gambela	34,299	7,850	5,172	4,657	4,971	4,033	413	68	27,164
Harari	5,904	10,024	6,821	2,986	397				20,228
Dire Dawa	8,822	10,560	6,638	1,765	97				19,060
Ethiopia	3,731,833	4,324,559	4,137,379	3,401,497	786,481	133,019	13,526	1,654	12,798,115
%age	29.16	33.79	32.33	26.58	6.15	1.04	0.11	0.01	

Source: Based on the CSA data, CSA 2016

Table 3: Livestock ownership in Pastoral Areas, 2014/2015

Livestock number and ownership		Afar	Borana (Oromia)	Guji (Oromia)	Bale (Oromia)	Somali	South Omo (SNNP)	Total
Cattle	Number of	1,495,054	1,081,553	1,503,241	1,566,521	631,059	1,776,996	8,054,424
	Number of HH	156,239	134,459	268,668	280,022	97,836	110,123	1,047,347
	Average Holding	9.6	8.0	5.6	5.6	6.5	16.1	7.7
Sheep	Number of	1,732,090	343,674	567,042	298,293	1,308,309	1,243,506	5,492,914
	Number of HH	144,920	60,496	148,752	48,011	95,036	69,912	567,127
	Average Holding	12.0	5.7	3.8	6.2	13.8	17.8	9.7
Goat	Number of	3,301,056	876,139	423,698	726,394	1,835,811	3,084,232	10,247,330
	Number of HH	170,139	92,727	87,981	136,867	114,383	64,271	666,368
	Average Holding	19.4	9.4	4.8	5.3	16.0	48.0	15.4
Horse	Number of		874	168,299	90,685		21,109	280,967
	Number of HH		874	90,730	37,832		3,508	132,944
	Average Holding		1.0	1.9	2.4		6.0	2.1
Donkey	Number of	133,481	73,762	97,997	239,705	148,724	26,215	719,884
	Number of HH	98,659	46,753	65,726	156,190	91,791	11,453	470,572
	Average Holding	1.4	1.6	1.5	1.5	1.6	2.3	1.5
Mule	Number of	636	2,102	16,291	17,272	71	5,110	41,482
	Number of HH	636	1,915	13,141	15,354	71	3,639	34,756
	Average Holding	1.0	1.1	1.2	1.1	1.0	1.4	1.2
Camel	Number of	460,624	75,622	24,193	29,639	362,291		952,369
	Number of HH	78,463	17,464	7,608	10,961	42,247		156,743
	Average Holding	5.9	4.3	3.2	2.7	8.6		6.1
Poultry	Number of	106,355	689,154	914,064	710,593	177,300	1,218,629	3,816,095
	Number of HH	17,865	86,440	137,528	116,638	29,192	96,405	484,068
	Average Holding	6.0	8.0	6.6	6.1	6.1	12.6	7.9
Beehives		310	68,953	223,067	190,847	2,022	73,949	559,148

Source: Based on the CSA data, CSA 2016

Table 4: Total Livestock Resources of Ethiopia, 2014/15

	Cattle	Sheep	Goats	Horses	Mules	Donkeys	Camels	Poultry	Beehives
Tigray	4,578,181	1,817,305	4,255,290	3,543	3,754	753,450	55,921	6,189,848	250,598
Afar	1,580,313	1,665,727	3,149,351		377	124,787	434,291	132,215	2,360
Amhara	14,710,911	10,024,277	6,064,944	420,760	157,213	2,677,429	66,364	18,031,121	1,361,329
Oromia	22,925,730	9,715,587	7,849,924	1,222,760	156,331	3,007,027	239,357	20,076,129	2,864,320
Somali	645,166	1,296,412	1,903,891		221	136,159	353,124	162,884	1,351
Benishangul-Gumuz	659,587	104,547	440,719	1,672	1,936	67,702	1,151	1,375,326	218,616
SNNP	11,215,636	4,580,220	5,092,628	382,927	78,334	630,492	2,865	10,433,773	1,127,618
Gambela	278,584	35,476	88,610	683	25	846		307,387	55,502
Harari	62,401	6,287	57,624	773		11,445	4,363	71,419	1,291
Dire Dawa	49,880	86,545	209,982		137	18,699	6,670	86,617	2,278
	56,706,389	29,332,383	29,112,963	2,033,118	398,328	7,428,036	1,164,106	56,866,719	5,885,263

Source: CSA 2015, Agricultural Sample Survey, 2014/15

Animal feed is one of the defining challenges for both the traditional and the commercial livestock sector. The traditional open grazing system faces steep competition from crop production, and studies point out that the major constraints for the very low production and productivity of livestock in Ethiopia are the poor quality and inadequate quantity of available feed. The commercial sector lacks sufficient feed production, and FAO (2019) and Bediye et al (2018) have identified some of the challenges facing the commercial feed sector in Ethiopia.

The most common problems for animal feed production in Ethiopia can be summarized:

- a) Seasonality, shortage and high prices of feed ingredients that limit sustainability and affordability of compound feeds;
- b) The commercial feed sub-sector and livestock production face severe and unfair taxation. For example, a 15% value added tax (VAT) is charged on feed ingredients and on compound feeds, leading to double taxation for feed ingredients and formula/compound feeds for ruminants. For poultry, the government has recently taken the positive measure of removing VAT on poultry feed ingredients and formula feeds, as most of the feed supplements, especially premixes, are imported from abroad;
- c) Ensuring feed safety and quality is one of the key challenges in the commercial feed sector to avoid high aflatoxin levels in oilseed cakes and compound feeds;
- d) The response to the demand for compound feeds has not yet reached the desired level as most of the feed processing plants are operating below capacity;
- e) Capacity to manufacture remixes, minerals and vitamins remains low and importation is costly in terms of price and of foreign currency;
- f) Technical services, both in terms of research and extension facilities, for promotion of the commercial feed sector remain very weak or non-existent;
- g) Feed processing plants are currently facing serious challenges in lack of analytical services mainly because of high cost and inadequate service delivery; and
- h) The Ethiopian Animal Feed Industry Association (EAFIA), established in 2008, is still a young institution and it has not yet reached the desired level of operation. It is facing technical, financial, and organizational challenges.

The FAO's study makes it clear that agro-industrial by-products could play a much more important role in meeting feed shortages in the country. It looks at all available agro-industrial by-products from flour millings, sugar factories, edible oil processing factories, breweries, and abattoirs as well as fishery by-products, slaughterhouse offal, bagasse, molasses, sugarcane tops and fruit peels.

Molasses is used for ethanol production, but all the other by-products can play an important role in the feeding of livestock, mainly in urban and peri-urban livestock systems. There are around 300 wheat milling plants, of which 140 are located in and around Addis Ababa; and some 202,134 tons of oilseed cake, from niger seed (noug), groundnut, sesame, cotton, and safflower, are produced annually. A substantial quantity of oilseeds is exported without value addition, decreasing the availability of oilseed cakes for use for livestock. The offal produced in the Addis Ababa Abattoir is processed into meat meal and bone meal for poultry feed. Breweries produce useful by-products and the total from domestic and modern breweries amounts to 635,343 tons of which 515,097 tons comes from domestic brewing and distilling in the Oromia and Tigray States alone – details of the contribution of other regions was unavailable.

In total, agro-industrial by-products simply do not produce anywhere near the necessary quantity of feed. One reason is that most agro-industries are running below capacity, in part because of insufficient or intermittent availability of raw materials, including wheat, oilseeds etc., and water and/or power. In addition, there are problems of proper storage of by-products at the production site or on farms, of transport to users quickly enough and in proper containers, plastic or metal with a cover and without leakage, or of proper loading and unloading of by-products from vehicles. Linking the industries that produce by-products with the feed industries, without intermediaries, and the introduction of drying technologies at production sites to increase shelf-life, building the capacity to properly manage the storage and handling at the production sites and on-farm, would all help to reduce wastage. Equally important is enhancing awareness of the importance of these by-products as animal feed, and inculcating the idea that these are valuable resources.

The FAO's study of feed availability and feed balance, which was conducted in 2018, the first of its kind for Ethiopia, also underscores that the main factors behind pastoral destitution in Ethiopia has been feed and water scarcity, as the natural resource base in the rangelands is shrinking fast. Institutionalization of a feed security system is therefore a necessity. It is needed to fully identify needs, resource availability, gaps, implications and ways to fill those both in Ethiopia and the region. This is required to make feed interventions in the country effective in immediate, medium and long-term as well as provide solutions for the region.

Another study, ILRI 2017, identified three key livestock commodity value chains – poultry for chicken meat and eggs, crossbred cattle mainly for milk, and red meat-milk from ruminants, indigenous cattle, sheep, goats, and camels. These comprised smallholder families and commercial production systems organized across lowland grazing, including both pastoral and agro-

pastoral systems, and highland crop-livestock mixed systems, both rainfall deficient and rainfall sufficient.

Overall, a number of studies, including the ones just cited, concluded that despite the livestock sector's significant herd size, and its vast contributions to the national and household economy, it continues to be constrained by numerous factors:

- ✓ Poor market access and lack of infrastructure limits the value added of farm/herds to an estimated 31.5% compared to 100% in member countries of the Organization for Economic Co-operation and Development (OECD).
- ✓ Short supply channels lead to moderate post-harvest losses: in milk, these are estimated at 3.4 %, and in meat to between 11% and 24%.
- ✓ Constraints in land and credit discourage entry into meat and dairy markets despite the possibilities of a lucrative business environment in which there are few competitors. Unfavorable regulatory and fiscal frameworks for land allocation and feed production respectively, lead to a reluctance of private operators to invest.
- ✓ Feed supply, in particular grass and fodder, is the main physical constraint to further expansion of the livestock population.
- ✓ Animal disease constraints include Foot-and-Mouth disease, small ruminant pests, tsetse-borne trypanosomiasis, external parasites (*Ekek*), sheep and goat pox, and contagious bovine pleuropneumonia (CBPP).

3. Framing the Processes of Agricultural and Rural Transformation

3.1. Conceptualizing Agricultural and Rural Transformation

The way the vocabulary of 'agricultural transformation' is being used in policy and program documents, or in daily conversations within the diverse national languages such as Amharic, Oromifa and others lacks clarity about what it means, or what may be expected of it; nor is there agreement on how to commence the transformation processes. Even more disconcerting is the absence of 'clarity' of the concept of agricultural transformation within Ethiopia's academic and policy discourse. Needless to say, concept of agricultural and rural transformation must be 'clear' and 'objective', that is, it must express, with precision, the underlying assumption about necessary and sufficient economic, social and technological changes, and offer unconstrained guidance for policy and program action. Furthermore, transformation is not only about the processes involved, it is also about the realization that it creates jobs, increase incomes, improves lives and livelihoods, and protect the natural resources.

As shown in section 2.4 above, there is also a considerable confusion and misunderstanding in comments about the state of Ethiopian agriculture. They all-

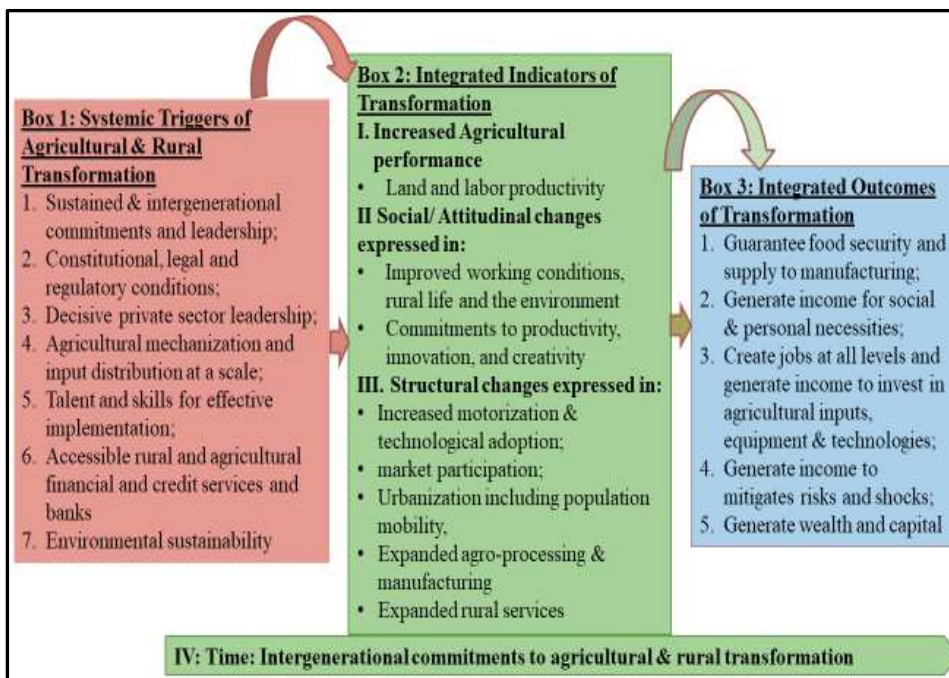
too-often simply emphasize quantitative crop production growth and ignore the absence of any improvement in the conditions of life of millions of Ethiopians and the lack of structural change which might offer new economic, technological, organizational and production possibilities. The differing perceptions about transformation trajectories raise three basic questions: first, what ‘measures’ agricultural and rural transformation; that is, how do we know if ‘transformation is happening’? Second, are there verifiable efforts that link agriculture/rural transformation to the manufacturing, services and urbanization at a decentralized level? Thirdly, will Ethiopia be able to induce transformation at the necessary speed and scale to end hunger and poverty by 2030 as called for in the Sustainable Development Goals (SDG) and save environmental catastrophe?

To be clear from the outset: agricultural and rural transformation is expressed here as the process of change from: a highly fragmented, risk and crisis-laden production system, rain-dependent, relying on traditional tools, with substandard conditions of life; to: one which is vibrant, wealth-creating, modern, system devoted to the improved wellbeing of the population, capable of producing for markets and supplying surplus for national demands for consumption, manufacturing and export earnings, by fully employing modern agricultural inputs, environmentally sustainable practices, and adopting farm machineries commensurate with the 21st century’s technological and digital innovations. Implicit in agricultural and rural transformation is the desire and the necessity to improve human condition in all its forms, and at all times.

To clarify and depict this definition, four integrated processes are considered to trigger and measure progress towards agricultural and rural transformation: *performance, institution, structure, and time*, the period necessary for the evolution of Ethiopian agriculture (Figure 6, Box 2).

The starting point of agricultural and rural transformation in Ethiopia is to remove the many obstacles discussed above, herein referred to as systemic triggers (see Figure 6, Box 1). As has been discussed above, principal triggers include: i) sustained and intergeneration commitments and leadership, ii) continuously adapted constitutional, legal and regulatory conditions that facilitate the transformation processes at speed and scale; iii) shared responsibility between private sector and the State, with the state providing the means necessary for a decisive private sector leadership of the transformation process; iv) availability of a technological and innovation option that expands and delivers agricultural mechanization; v) commitment to the creation of human talent and skills to effectively and accountably implement agricultural and rural transformation; vi) facilitation and where necessary creation of rural and agricultural financial and credit services and banks, and vii) early and extensive work on environmental sustainability.

Figure 6: Processes of Agricultural & Rural Transformation: Triggers, Indicators & Outcomes



Source: Diriba, 2018. *Overcoming Food and Agricultural Crises (and an expanded second edition, forthcoming)*.

Simultaneously, and as systemic triggers are acted upon, collective action is needed to induce social and attitudinal changes embodied in ‘institution’, that is totality of the norms, values and relationships that characterize Ethiopian society with a profound influence on agricultural performance, accepting, for example, as a way of life the substandard conditions of living of millions of rural households (see Figure 6, Box 2). ‘Institution ’includes political institutions, traditional and/or modern elements, family and community structures, religious bodies, ideologies, beliefs and values. It is about how a society perceives or recognizes the conditions of life, environmental changes, production systems, and interactions inside or outside an immediate community or societal structure. Seven characteristics of institutions need to be considered to unravel the puzzle of development and agricultural transformation in Ethiopia. These are: cultural and normative practices; religion and faith; functional and legal practices; cognitive processes; organizational densities; persistence; and organizational manifestation. They offer an entry into and a deeper understanding about what holds back and/or prevents Ethiopia from innovations and embracing technologies to free millions of its citizens from chronic deprivation of food and basic necessities. As such, they provide a deeper understanding of structural

change and equilibria within and among the factors that make up the national economy. These and additional elements discussed below will serve as integrated indicators of transformation.

Another indicator of transformation is structural change (see Figure 6, Box 2) which measures progress towards agricultural transformation; it measures changes from the traditional systems of production, relying on ard-plow and rainfall, to modern production systems that utilize mechanized practices, allows significantly enhanced land and labor productivity, and offers a shift in the relative proportion of agriculture within the broader national economy, as well as changes in the living standards of the population. In a broad sense, structure is the most important input of social and economic transformation. For this reason, structural change is complex and it is central to accelerating and/or constraining agricultural transformation over time.

The third process is about measuring outcomes of agricultural transformation, that is ‘performance’, being measured in terms of improvements in the wellbeing of the population, and it is assessed in the following five ways, which characterizes their definition of food security for Ethiopia (see Figure 6, Box 3).

- ✓ First, agricultural performance must be evaluated in terms of its capacity to provide food security, at the most basic level, for human nutrition and survival requirements for producing and consuming units. Nutritional requirements can be met directly from farm products and/or from markets in exchange for farm /labor income.
- ✓ Second, agricultural performance must also be assessed in terms of its capacity to meet the social, personal and communal, and economic necessities of life such as shelter, clothing, medical, educational and locally determined communal expenses including the capacity to pay for leisure activities, even if these are rare for most Ethiopians. In other words, agricultural performance assessment must be expressed in terms of cash income that can pay for health, educational and other related social obligations for the participants in the sector.
- ✓ Third, agricultural performance must go beyond the maintenance of life; it must serve as a business enterprise where farmers invest in innovation and technological change to enhance land and labor productivity. Agricultural performance should be measured in terms of its capacity to afford producers the ability to purchase farm inputs and tools including fertilizer, seeds, pesticides, and the replacement of tools including *maresha*, hoes, racks, and investments in mechanization, hay-making, milk-processing and beef production, afford agricultural machine rental or purchase investment in irrigation to reduce the risks of dependence on rainfall as well as investment in modern livestock rearing and animal product processing.
- ✓ Fourth, agricultural performance must also be assessed by capacity of households, the producing units, to mitigate risk in the event of crop failure or animal deaths. Risk can be mitigated by savings put aside from agricultural

produce either in-kind or in cash or through purchase of risk insurance, if such schemes are available. Agriculture should also provide a cushion for shocks and provide for ‘risk management’ either in direct savings from crops or animals or in cash. Although agricultural risk management and/or ‘risk insurance’ is a modern concept to most Ethiopian farmers, the concept is as old as the emergence of agriculture which has developed a built-in traditional system to provide a cushion in times of need in the form of grain saving, borrowing, reciprocity, migration, crop diversification, dispersion of farm plots in different locations or differing agro-ecological zones, and other ways.

- ✓ Fifth, agriculture performance also includes saving beyond year-on-year consumption and expenditure, and must be able to contribute to creation of wealth, guaranteeing pensions or social insurance. Implicit in the performance matrix is the extent to which Ethiopia’s agriculture is open to and utilizes mechanization options that could have profound impact on performance of the agricultural sector as well as improve the wellbeing of the population.

Finally, it is important to be mindful of the time it takes to fully rollout agricultural and rural transformation. This refers to the evolution and temporal changes in agriculture, and it explains the sequence of events that influence the structure and performance of agriculture over a sustained period of time. Individuals, societies and governments often become pre-occupied with on-going and current events, ignoring the sum total of changes over a long period of time, generally referred to as economic or social history. History, however, is not just the record of events from the past but is also the science and action of human societies as they happen. It is important that we understand the social, economic and technological changes of a society through the lens of time. That is, ‘time’ as expressed in a single cropping season, a program or project period, a particular event such as a revolution, the duration a government stays in power, a generation, centuries or even millennia. It is important to observe what may have happened in successive cropping seasons, or during a series of program cycles, over the period of successive governments, or even over centuries or millennia. Without this, Ethiopia misses the effect, the impact of cumulative change over time.

3.2. Agricultural and Rural Transformation in Development

Literature

The most widely accepted characterization of agricultural transformation is one that describes the shift from highly diversified, subsistence-oriented farms towards more specialized production, and market supply. Delgado (1995:3) further expands agricultural transformation as offering ‘specialization in

production, greater use of purchased inputs, greater resource flows to farming, and substantial cuts in unit costs of production from technological changes.’ In fact, numerous characterization and descriptions of agricultural transformation abound: agricultural populations move out of farming, becoming dependent on the market, rising ratio of agribusiness value added as part of rural-centered agricultural transformation, aggregation of small farms, technologies responding to factor prices (land, labor and capital), increased infrastructure, higher information/communication penetration, and integration of agriculture into a wider economy (Timmer 1998, FAO 2017, Naseem 2017). These characterizations of agricultural transformation in international literature are important, but they do not tell us what actually triggers the transformation processes, whether they need accidental or deliberate political action, or what conditions must be put in place for agricultural transformation to happen or to be rolled out on a large scale. They do not suggest what performance matrix should be deployed to understand and measure if a transformation is taking place at the desired speed and scale. And most markedly, international transformation literature does not focus on the quality of lives of the agricultural population or on changes in their wellbeing, except through implicit assumption about ending hunger and poverty.

Historically, when agricultural transformation started in Europe, the principal motivation was to reduce the price of food in order to allow for cheaper wage labor. Lewis: “If the capitalist sector produces no food, its expansion increases the demand for food, raises the price of food in terms of capitalist products, and so reduces profits. This is one of the senses in which industrialization is dependent upon agricultural improvement; it is not profitable to produce a growing volume of manufactures unless agricultural production is growing simultaneously. This is also why industrial and agrarian revolutions always go together, and why economies in which agriculture is stagnant do not show industrial development” (quoted in Timmer 1998).

A number of other objectives for agricultural transformation have been shown in development literature, especially since the mid-20th century. The more immediate and primary objectives of investing in agricultural transformation is “to reduce hunger and poverty”, that is provide an agricultural-led development strategy that would produce more food, and generate more employment in the short-run, as has been the case with Ethiopia’s policy guidance of the Agricultural Development Led Industrialization (ADLI). The hunger and poverty reduction objectives are important for developing countries such as Ethiopia; but they

should not be the ultimate goal of agricultural transformation. This must be modernizing the agricultural sector for the long-term, and improving the rural living conditions of the population, thereby reducing poverty and hunger.

Releasing surplus labor in agriculture long with the rising land and labor productivity is not an end in itself for Ethiopia or for many developing economies of Africa. In fact, in Ethiopia, numerous factors are pushing out the agricultural labor force without there being sufficient and necessary conditions to absorb it in the manufacturing and service sectors. Surplus labor must serve for the gradual emergence and expansion of the manufacturing and service sectors, the later motivating the former. Another objective of agricultural transformation in international development literature is to decrease the relative role of agriculture in the economy¹⁰. Such views continue to influence scholars and politicians alike. In a recent literature on Ethiopia, the Prime Minister of Ethiopia Abiy Ahmed, reflects a similar sentiment of agriculture as ‘dying as it is growing—‘ዓዳጊሟች’’, and he states that “ግብርናዉ የፈለገ እድገት ቢያሳይ የአንዲትን ሀገር አዳጊ ፍላጎቶች እስከ መጨረሻ ይዞ መጓዝ ያጠያይቃል። ለዚህም ነዉ አንዳንድ ምሁራን ግብርናን “አዳጊሟች” ሲሉ የሚገልጹት” (መደመር: 2012: 218)። The persistent views of ‘dying agriculture’ is far from the reality in Ethiopia. Agriculture has been and will continue to be the most important sector with an undiminished role in the national food and economic security objectives. What has happened in historical processes, and can be expected to happen in Ethiopia, is the ratio of *agriculture’s primary value will decrease* (expressed in crop and animal production, that is without considering agricultural derivatives). This is, however, an inadequate measure of the role of agriculture, and as discussed above, when agriculture and rural economies are transformed, the role of agriculture is elevated, not diminished, as the commanding element in the Ethiopian economy and peace and security; surplus labor will be transferred to agricultural product processing. Heavy industrial development remains a long-term prospect, and initial investible surplus, income and capital, has to be generated in agriculture in order for growth to occur broadly in the national economy. In fact, of course, agriculture adds significant value to other sectors such as the manufacturing and service sectors, in the form of agro-processing. Certainly, given the dominant¹¹ size of agriculture in Ethiopia, it will remain the most vital sector of the national economy. The non-agricultural

¹⁰ See Staatz, 1994. The Strategic Role of Food and Agricultural Systems in Fighting Hunger Through Fostering Sustainable Economic Growth. See also Timmer 2007 in Handbook of Development Economics, Volume 1.

¹¹ Dominance of agriculture is expressed in the number of people it employs, geographical dispersion, number of households, and as the principal supplier of national consumption, manufacturing and export earnings.

sectors, without agricultural product derivatives, will be smaller relative to agriculture and its allied economic benefits.

The challenge for Ethiopia and other developing countries in Africa is to balance resource allocation judiciously among agriculture, manufacturing and services sectors and offer equitable incentives to develop urban and rural infrastructure. Withholding resources too soon, or withdrawing them from agriculture to finance expansion in other sectors will have a dual impact, delaying agricultural transformation and limiting supplies of food and raw material, such as cotton, oil seeds, or grain for the manufacturing and the service sectors. The service sector will also suffer from dampened demands as a result of high food commodity prices, having massive effects on urban consumers as well as the wage-dependent rural population. These are, indeed, the precise conditions playing out in contemporary Ethiopia.

To deal with the effects of agricultural production deficits, national policies are often geared towards importing agricultural commodities to curb price rises and limit potential social unrest. This policy option may be necessary to address the short-term supply deficits. In the medium and long-term, however, it can only further exacerbate a downward spiral of agricultural growth as domestic producers are unable to compete with the highly productive farms of developed economies. As is the present case in Ethiopia today, domestic wheat prices are nearly three times higher than imported wheat. The low price of imported wheat, combined with periodic peaks in food aid deliveries, often undercuts possible price incentives that could have facilitated investment and innovation for domestic producers. On a recent visit¹² to Arsi in Oromia Regional State, the author saw conflicting responses to the low price of imported wheat and vegetable oil. Producers of wheat were strongly critical of the lower price of imported wheat; consumers in both urban and rural areas expressed approval.

Policies advocated in the international development literature, to “squeeze agriculture on behalf of the more dynamic sectors of the economy”, are highly damaging to any possible transformation of the sector, especially in countries where agriculture is the principal source of food and income. The context of Ethiopia is vastly different from the European and American transformation processes that have largely informed the scholarship of much of the writings and conceptual underpinnings of agricultural and economic transformation. Contrary to the “squeezing out” hypothesis, agriculture and the rural sectors have to be transformed and be modernized to allow for any expectation of economic equilibrium. If and when land and labor productivity

¹² A field visit to Arsi and the adjoining areas is a regular exercise of the author in part to inform the write up of this discussion paper and preparation of the second edition of his “Overcoming Food and Agricultural Crises in Ethiopia”.

increases are comparable to the globally motorized farms, then it may be feasible to anticipate transmission of the productivity gains in agriculture to other sectors of the national economy in the form of savings, lowered price of agricultural and manufactured commodities for consumers, and capital flows from agriculture to urban areas for investment in services or manufacturing sectors without being “squeezed”. In an economic equilibrium, the value of the agricultural surplus is capitalized in and outside agriculture; and land is capitalized as agricultural land, through aggregation and consolidation, with expanding urbanization offering lucrative land values. This also assumes State facilitation of decentralized urbanization, rural industrialization, agro-processing, technical assistance for skills development, credit and financing arrangements, property rights, and national educational systems that can respond to emerging talent demands across all sectors. These natural process of capital flows, from agriculture into the manufacturing and service sectors, cannot however occur if the agricultural sector remains traditional, with low productivity, and living standards of the population near or below subsistence as is the case in Ethiopia. If agriculture is forcibly “squeezed” by State intervention, it creates stagnation, not transformation.

Implicit in the processes of agricultural transformation are greater performance of institutional and structural changes through time that will bring about resolution of national food concerns, induce voluntary resource outflows from agriculture, and bring about the adoption of technologies without passing through the historically costly processes of technological invention. Agricultural and rural transformation induce quantitative, structural and technological transformation of largely traditional and subsistence agriculture, and can be expected to improve living conditions. Indeed, Ethiopia has sought for this, in policy terms, as when the EPRDF administration introduced the Agricultural-Development-Led-Industrialization (ADLI) policy to provide an underpinning for developmental architecture. The ADLI has, however, had difficulty in getting off the ground in the spirit expressed by its designers; it is now necessary to revamp an integrative framework of transformation in the light of Ethiopia’s present context offered in the concluding section of this discussion paper.

It is important to keep in mind that rural and agricultural transformation are inseparable and they offer inclusive development opportunities for all Ethiopians. As important, in the short and medium term, is the fact that most growth opportunities will continue to come from agriculture: food production, employment in agriculture and allied sub-sectors, food manufacturing, food services, and agriculturally based trade. These can and will make significant contributions to the non-agricultural growth processes including employment generation.

3.3 Triggers of Agricultural and Rural Transformation

The question of *what actually triggers and drives agricultural transformation* is an important one and often neglected in development literature as well as in development discourse. There are no clear-cut theoretical models nor any uniform procedures to guide countries in starting or sustaining agricultural and rural transformation processes. Responses to and guidance of transformation can only be found in broader social, technological and modernization theories, and most of the suggested options are dependent on country and context-specific political and policy commitments to transformation. Within broader development processes, countries can consider streams of technical changes and complementary reforms (see Figure 6). These can include the too-often neglected roles of institutions, the relevance of legal systems, organizational capacity, cognition and leadership capacities, social norms and values, and commitments to change, as well as recognizing the many facets of the problems of traditional agricultural and rural development. Ethiopia's commitments, for example, must include ways to unravel the legal constraints, and provide for universal property rights permitting land consolidation to facilitate mechanization and durable investment to improve the land, enhance organizational efficiencies and accountabilities, lower costs of agricultural inputs, reduce high transaction costs, and deliver investment in infrastructure. Additional triggers include accessing the knowledge and skills embodied in technologies and management practices, and the provision of an organizational system that recognizes and motivates citizenry, especially youth, to participate and invest in agriculture. In a 21st century context, economic growth and social changes depend increasingly on embodied knowledge and self-learning. A critical task is to identify the most effective mechanisms to transfer knowledge and skills to agricultural households and assure them of an inclusive and equitable share of the benefits. In this context, the traditional extension system will continue to be needed but its efficacy will have to be complemented or even replaced by online learning and private sector agricultural extension services.

Agricultural transformation is contingent on organizational, social and technological adaptation, commitments to modernization and improvements in the living conditions of the farming population. The 20th century scholarship that continues to influence the development agenda in Africa, and certainly in Ethiopia, is now facing vastly different forms and processes in the 21st century. Naseem et al (2017) has rightly noted, “the characterization of contemporary structural transformation primarily in terms of productivity, employment, and migration seems unsatisfactory. Other attributes need to be considered that may affect the process of structural transformation. There are considerable differences in the initial conditions and the global economic environment in which today's

agriculturally-based economies find themselves in, that the process of structural transformation is likely to be different in the coming decades.”The study points out that new opportunities may create an environment that is more conducive to a rural centered agricultural transformation, with, for example, new agricultural value-added products and services closer to farms allowing households to generate incomes through non-farm activities, often enabled by information and communication technologies and other technical advances. Diriba (2018) has emphasized that the holy-grail of agricultural transformation is to be found in institutional changes that will facilitate and capture economies of scale in the provision of services such as mechanization, delivery of inputs, financial services, and transmission of skills and know-how to the farming population. It should also be noted that the increased competition for export-based markets, a major element in the Asian structural transformation experience, is largely inapplicable for Ethiopia, due to the paucity of technological openings, lack of financial services, and limitations of talents and skills.

Sustaining agricultural transformation has to look to important policymaking and programming activities including: a) provision of a quantifiable vision and strategy for agricultural transformation (Mellor 1973); b) sustained and verifiable inter-generational commitments over an extended period of time (Diriba 2018); c) sustained resource allocation to the rural and agricultural development, providing for example, 10% of national expenditure to agriculture (AU/NEPAD 2010); and d) a carefully balanced prioritization of agricultural and rural transformation with other sectors of the economy including manufacturing, services, urbanization and infrastructural expansion.

It is important to emphasize the inseparable linkage between agriculture and rural transformation. The links are not imaginary; rather policymakers and development practitioners must be guided by pragmatic resource allocation for inclusive and decentralized development opportunities. There are three major considerations.

- First, at the most general level, to achieve the ambition of transforming agriculture from subsistence production to one of technology-employing agriculture, Ethiopia must induce technical change. This must cover policies, investment, and an enabling environment focusing on the removal of organizational and legal constraints for all sectors. It must facilitate and ease a greater use of agricultural input supplies, increased land and labor productivity, the use of fertilizers, pesticides, seeds, and irrigation, as well as the expansion of manufacturing and service industries, all of which will result in structural transformation. In Ethiopia, no sector can be transformed in isolation. The relative shift of the ratio between agriculture, manufacturing and services should not be used as a tool for resource-

allocation decisions nor should it be relevant as an indicator of transformation.

- At a sector level, within agriculture itself, crop productivity increase is certainly necessary but this is insufficient to produce all-inclusive agricultural transformation. As we have seen, partial and low-level utilization of agricultural inputs has tended to increase crop productivity per hectare of land. Combined with the expansion in the area of land usage arising from population increases and utilization of agricultural inputs, this has led to increased quantitative crop production at an aggregate national level. This has provided a temporary respite to poverty and hunger, but in spite of crop productivity gains, the organizational, structural and technological constraints have remained. Agricultural and rural transformation have not been taking place at the scale and speed they ought to be in Ethiopia. The apparent relative ‘decline in poverty and hunger’, in monetary average, is not a signal of agricultural and rural transformation; millions of Ethiopians continue to suffer from substandard living conditions including hunger and income poverty.
- Rural transformation is often assumed to occur as part of an agricultural transformation process, or as an outcome of other economic processes¹³. For a comprehensive transformation to take place on a scale that is sustainable and inclusive of the people’s conditions, the rural areas must become an integral part of the political and programmatic choices that make up the transformation agenda. Rural transformation means creation of an ecosystem in which the transformation of agriculture takes place, improved human wellbeing is provided, environmental protection is ensured, changes in the mindset of the population commence, rural services are provided, conditions of life for the rural population significantly improved with resulting market participation, and the availability of a large proportion of home consumed commodities.

4. A Call to Action: Incentives and Reform Considerations

4.1. Quadruple Sector Approach to Transformation

Implementing agricultural and rural transformation cannot take place without an integrated and synergistic linkage with other sectors of the economy. In context of Ethiopia, there are four interlinked sectors: agriculture along with its rural environs, manufacturing, services, and urbanization. Each of these are expanded further below. The context and developmental stage of Ethiopia

¹³ Ethiopia’s rural development policy document was developed in 2004, There has not, however, been any meaningful or practical action to realize it.

demands recognition that agricultural and rural transformation are intrinsically linked; the one cannot transform without the corresponding transformation of the other. Nor can agriculture, manufacturing, services and urbanization succeed in isolation of each other.

The starting point for decisive and urgent agricultural and rural transformation is the recognition that Ethiopia's smallholder agriculture is faced with severe challenges that have been accumulating for many decades. Ethiopia has now put in place a number of building blocks to rollout an economy-wide transformation at speed and scale. These building blocks include many decades of experience across different sectors and the economy, allowing for expanded infrastructure and services, the conception and construction of industrial parks at strategic locations, expansion of primary, secondary and tertiary educational opportunities, and the achievement of quantitative production increases in agriculture. Equally, in implementing agricultural and rural transformation, Ethiopia must climb new heights of economic and social transformation, building on the gains and experiences of the past, and committing itself to a long-term, inter-generational, and sustainable transformation of agriculture. These long-term commitments will require continuous adaptation of programs and strategies within and across each of the principal sectors.

The quadruple sector approach offers an inclusive platform of development that can dramatically improve the conditions of Ethiopia's population, especially those in rural areas. Unquestionably, rolling out an economy-wide transformation with agriculture as a lead sector demands bold commitments and tangible actions by all Ethiopians and its leadership at all levels. It involves creating sufficient and necessary conditions to trigger and sustain agricultural and rural transformation.

Firstly, *agriculture and rural transformation* must remain central and serve as the precondition for the transformation of the other principal sectors. For this reason, Federal and Regional State guidance is critical to establish linkages among the principal sectors and placing agriculture as *primus inter pares*, first among equals.

Secondly, the development of *rural industrialization and expanded manufacturing* capacities must be supported, initially focusing on agro-processing including production of poultry, dairy, beef cattle and oilseeds, and flour mills just to mention a few areas. The very foundation of rural industrialization is enhanced productivity and a gradual move to specialization in specific products. A comprehensive list of realistic and locally viable rural industrialization opportunities and options must be worked out at *Kebele* and *Woreda* level. Rural industrialization must be conceived strategically, and it must reflect the condition of Ethiopian smallholder farmers. In this way, rural industrialization can serve as an inclusive development opportunity.

Third: Decentralized urbanization. Urbanization typically accompanies rapid progress of agricultural and rural transformation, which in turn can be fueled by expanded urbanization, especially in the growth of manufacturing and services. As agricultural transformation takes off, and as a result of rises labor productivity, increasing numbers of people will be compelled to leave the rural areas. These people will be required to either sell or mortgage their land and move to urban centers to establish themselves as wage laborers or traders. A decentralized urban development strategy commensurate with strategic urban planning must be considered, providing services such as land valuation and designation of urban sites, water supply, electricity, educational and health facilities, housing designs including affordable building material, among others. The key is to ensure that there is a sufficient pull factor at the *Kebele* and *Woreda* level for urbanization so that all surplus labor does not try to move into Federal or Regional capital cities. While some migration is unavoidable, sufficient urban service delivery incentives and policy instruments must first be put in place at a decentralized level, focusing on small towns. This must include the provision of rural housing, including key facilities such as rural electrification, water and rural transportation systems. Rural transportation systems permit farmers to commute to and from their farms should they decide to retain a dualistic economic model.

Finally, there's the need for *social, physical, digital and market infrastructure and services* as these will increase dramatically as the productive sectors of the economy transform.

In summary and as already presented earlier, the quadruple sector transformation framework replaces the ADLI framework, and a major task will be to balance resource allocation judiciously among the principal sectors. To reiterate: withholding resources too soon, or withdrawing them from agriculture to finance expansion in other sectors will delay agricultural transformation and limit supplies of food and raw material, such as cotton, oil seeds, or grain to the manufacturing and service sectors. It would also undermine the national and household wealth creation that can be reinvested in infrastructure and technology generation. The service sector would also suffer from dampened demands following high food commodity prices, and have massive effects on consumers as well as wage-dependent population in both rural and urban areas. These are, in fact, the precise conditions playing out in contemporary Ethiopia.

This four sector transformation agenda must now be supported by homegrown and Ethiopia-specific scholarly researches focusing on the transformation processes, triggers and indicators. These studies must offer a realistic assessment of options, and provide practical and policy relevant recommendations. While lessons from successful transformation elsewhere in the world are useful to suggest, inspire and motivate ideas and actions, it is also important to recognize that past experiences, especially agriculture, in Europe, North America and elsewhere, cannot be transferred *in toto*. They do not

correspond to 21st century Ethiopia. Ethiopia has to identify transformation pathways that reflect its own cultural, institutional and domestic capacities.

A number of incentives and reform priorities are suggested here as a basis for enacting agricultural and rural transformation in the light of the ‘systemic triggers, integrated processes and integrated outcomes’ detailed in the previous sections (see Figure 6), and expanded below.

4.2. Sustained and Intergenerational Commitments to Transformation

The starting point for Federal and State leaders is to commit to and lead the agricultural and rural transformation with vision and tenacity, with all the political capital they can command, mobilizing the public at large, and inducing the necessary technological and social changes. There can be no illusions about the complex processes of social, economic, technological and legal processes needed to enact agricultural and rural transformation. It will take generational commitments to fully achieve them. Without the visible commitment of the highest authority in the land, transformation will not take off. Ethiopia’s agricultural and rural conditions cannot compare with modern agricultural practices elsewhere in the world, nor does the current stage of agricultural development offer any respite for social and economic malaise affecting millions of Ethiopians today. Ethiopia cannot afford to postpone agricultural and rural transformation as it did in the 1960s. Ethiopia has ignored the signals of the devastating famines in 1973/74 and 1983/85. Since then, nearly all parts of the country have been engulfed by food shortages of various magnitude. The absence of episodes of famine or of famine mortality, thanks to continuous foreign aid and the work of humanitarian workers, must not be mistaken for any normal agricultural economic situation. It is anything but that.

It is similarly important to underline that a reduced ratio of agriculture relative to the overall economy should not be mistaken for the commencement of agricultural transformation. The key determinants of transformation are increasing labor and land productivity, gradual and expanded utilization of mechanization, reduced food insecurity and vulnerability, and visible evidence of agricultural wealth creation that can be invested within and outside agriculture. Agriculture and its twin, rural transformation, must be supported by efficient organizational arrangements including agricultural banks and rural financial services, skills and technology delivery systems. Beyond mere policy intent, agriculture and rural transformation must be demonstrably linked with manufacturing industries, developments in the service sector and decentralized urbanization. For Ethiopia, agriculture will certainly continue to play an undiminished role in food security and provide essential economic functions. To

fully appreciate the commanding heights of agriculture, it is necessary to calculate the value of textiles, leather products, flour mills, oil presses, restaurant services, bakeries and others. In effect, there is essentially very little manufacturing or services without contributions from the agricultural sector.

The Federal Government and the Regional States must craft a carefully thought-through division of labor to avoid duplication of functions regarding the agricultural and rural transformation processes. There are a number of ambiguities regarding the economy to be seen in the constitution. The Federal Government and Regional States must prioritize and invest in infrastructure to support urbanization and rural industrialization. Prioritized, strategic centers for agricultural and rural transformation must be identified to serve for a decentralized urbanization strategy as well as supporting transformation initiatives across all sectors of the economy, including manufacturing, services, agriculture and rural livelihood improvement. This can be achieved by investing in rural roads, housing, electrification, and expanded digital services, both Internet and telephone, and enacting social change. With economic opportunities, and improved living standards for both rural and urban populations, it is feasible to anticipate gradually increasing household participation in markets, a gradual shift from utilizing home processed supplies to market supplied processed goods and services.

Together with the private sector, it is important that the Federal Government and Regional States work in tandem to develop a coherent political and policy for decentralized urbanization, for population migration including property rights that will facilitate and support urbanization strategies and programs. Urbanization will also serve to create transmission centers of competitive market prices. Competitive markets are usually characterized by prices being near to the marginal cost of production and an absence of rent seeking behavior. They facilitate efficient allocation of scarce resources. One way to measure market efficiency is to see how large the price gaps are between domestic prices and border prices. Market price gaps result from poor infrastructure, high processing costs, obsolete technology, government taxes and fees, high profit margins captured by various marketing agents, illegal bribes and other informal costs.

Government guidance is critical to establish linkages among sectors. During the initial period, agriculture and rural sectors must be treated *primus inter pares*, first among equals, vis-a-vis other sectors of the economy in order to put agriculture firmly on the path of transformation. Cereals, pulses, and oilseed production must be linked to agro-processing manufacturing and value adding activities such as flour mills, biscuits, oil presses, and increasing national production to meet demands and reducing prices to consumers. Similarly,

livestock production must aim at increased milk processing and packaging, meat processing and value addition activities. Cotton production should be fully linked to textile manufacturing.

A decline in the share of primary agricultural products will occur gradually as modernization and mechanization become firmly rooted, as farm sizes begin to consolidate, as land and labor productivities significantly increase, and manufacturing and processing industries expand. So, in order for agricultural transformation to be sustainable, it must be pragmatically but firmly linked to developments in the manufacturing and service sectors of the economy. Finding an equilibrium between the agricultural, manufacturing and service sectors is the most important political and technical decision Ethiopia will have to make. It is important to keep in mind that owners of manufacturing and service sector industries, the elite, have proximity to the political power that can influence policy choices and other decisions in their favor. This might lead to the withdrawal or significant reduction in investment in agriculture and rural areas, so undermining and/or delaying agricultural and rural transformation. This possibility calls for serious political arbitrage through, for example, exemplary and dedicated governance to support a transformation agenda, both at federal and regional state levels, private sector and active civil society voice. An economy-wide structural transformation can manifestly lead to greater employment across all sectors, especially in agriculture and allied rural activities, at least initially. It will also lead to improved incomes, especially as the price of food drops following surplus production that exceeds domestic demands, coupled with better and expanded services for housing, water and electricity as well as educational and health facilities.

4.3 Legal and Regulatory Environment to Facilitate Transformation

To realize agricultural and rural transformation, requires thoughtful and boldly considered land consolidation and property rights arrangements. The question of land consolidation needs to be defined within a broader property rights policy that embraces leasing, mortgaging, and facilitating long-term strategic investment on the land. Land property rights should be considered from the point of view of output growth and the welfare of the smallholder farmers. They should not be seen through the prism of politics and ideology as in the past, but rather, aligned to allow for the basic sustenance of life when cultivated, and offer a legal means to mortgage, lease, or liquidate when appropriate. They should also facilitate utilization of agricultural mechanization and rural industrialization. Land rights should be properly and pragmatically considered so that land size does not continue to be the breeding ground of an interminable food crisis. Land ownership or entitlement, in fact, must allow farmers to either stay on the farm or

move to urban areas where he/she might invest in business activities using the income from land liquidation. The liquidation process, with appropriate valuation, must offer access to capital and the opportunity for consolidating fragmented land holdings. Land property rights is one of the transformative areas of institutional change that can spur agricultural growth and develop other sectors by turning “dead capital” into investible and transformative funds.

Importantly, the consolidation process must also protect smallholder farmers from the greed of the elites and rent-seekers, as well as from eviction by creating a legal mechanism for equity, and the determination of a ‘fairer land value’ system based on its relative location. It must consider the specific context of land within pastoral areas under special arrangements and facilitate investment in water drilling and pasture land management, as well as the clearing of bushes to minimize and reverse desertification. It should classify land in crop areas keeping in mind commercial and irrigation potential and feasibilities for expansion; and differentiate land in suburban areas and areas of urban expansion with the highest land value.

Policies and programs for land property rights must help reverse declining land availability, fragmentation, and land degradation. A crucial element for land consolidation must be to ensure farmers’ access to and ability to employ technology to enhance productivity. The debate about farm-size, of small versus commercial farms, is based broadly on ideological rather than practical considerations. Farm size aggregation will pave the way to link the development of agriculture, manufacturing, services and urbanization and the accompanying investment in infrastructural development. If legal and constitutional conditions are met, farm size aggregation becomes a matter of individual choice rather than elite-motivated political calculation. It also helps eliminate duality of land system between rural and urban populations. Overall, land property rights can facilitate the emergence of small and medium scale investments in agricultural activities by providing the legal means for land transfer on a long-term basis (whether by lease, sale, mortgage, or rent). This calls for amending the constitution, as well as the provision of an acceptable legal and regulatory environment.

No one can foretell how farm households will respond to full ownership rights, and meaningless pontification is of no help. Nevertheless, farm size aggregation will certainly pave the way to link the development of agriculture, manufacturing, services and urbanization and the accompanying investment in infrastructural development.

4.4. Decisive Agricultural Mechanization and Access to Inputs

The immediate and supreme priority for the 21st century Ethiopian is adoption of agricultural mechanization and involvement in the ‘creative destruction’ of technology. *Maresha* and hoe cultivation system must gradually be replaced with mechanized crop and livestock husbandry. Agricultural transformation entails a transition that links smallholder farmers to a progressive adoption of technologies, improving on/off-farm transportation, storage systems

and the increased use of irrigation as well as the development of high yielding crop varieties and animal species.

Agricultural mechanization demands the creation of new institutions to support mechanization and technological innovation to accelerate the transformation drive. Mechanization also requires the educational system to be technically oriented; universities, technical schools and specifically dedicated training centers must become focused on skills creation. It is imperative to establish Centers of Excellence and demonstration centers for agricultural mechanization, for example, starting in Arsi and Bale where already farmers are using tractors and combine harvesters. The Government must increase Research and Development (R&D) funds significantly at all levels.

The Federal and Regional institutions must collaborate to train a new generation of farmers who will be instrumental in rolling out agricultural transformation. These trained farmers will perform a number of functions. They will serve as technology-model farmers and provide advisory service to both skilled and unskilled farmers, demonstrating that innovations are compatible with farmers' existing pool of knowledge. They can also provide agricultural education to the youth at agricultural demonstration stations, possibly established in each *kebele* farmers' association area. They will in fact become agricultural trainers and teachers.

Youth must be the major force of mechanization in agriculture, participating in farming, being tractor operators, workshop service providers and ensuring diligence and work preparedness. There is a need for mechanisms under which existing farming populations can progressively improve their skills. It is necessary to create a conducive environment for technical schools to produce a skilled and industrious young workforce with a desire to work diligently in agriculture.

Replacing the ox-plow and manual agricultural production practices with mechanized systems is the *sine qua non* of agricultural transformation. The experiences that we have referred to in the case of Bale, Arsi and other locations where some mechanized agriculture has been employed must be expanded. The first order of business of the Federal Government and Regional States, jointly with private and in joint public-private partnerships, must be to identify where tractor/harvester assembly plants and accessories, can be strategically located in Ethiopia suitable to the soils and the terrain. During the initial period, however, importing tractors and accessories, combine harvesters, milking machines, hatcheries and incubators, enhanced storage systems, and other innovations must be prioritized. Demonstration centers for agricultural mechanization, tractor and combine harvester hiring stations should be established throughout the country.

All the stages of agricultural and rural transformation involve structural changes, increases in household income and reduction in poverty. Transformation in the agricultural sector has been recognized as having one of the largest impacts

on reducing poverty. In China, transformation in the agricultural sector is estimated to have been 3.5 times more effective in reducing poverty than anything else. In Latin America, the figure is 2.7 times. Successful rural transformation is, therefore, the key to reducing poverty as a majority of the poor are to be found in rural areas. Building on the successful experience of a quantitative growth of crops, and the opportunities to expand the potential of the livestock sector, Ethiopia must now aim to double, triple or even quadruple its present productivity levels by introducing mechanization and other actions that will facilitate structural transformation. Labor and land productivity, if combined with increasing utilization of mechanization and other agricultural inputs, are the proven indicators of agricultural transformation. In this sense, labor productivity is closely linked with household income and poverty reduction.

4.5. Decisive Private Sector Lead in Agricultural and Rural Transformation

Ethiopia's smallholder farmers, and the private sector in agriculture, have not been able to challenge heavy-handed Government interventions, especially the legal and constitutional constraints and organizational inefficiencies. With deregulation and explicit encouragement of the private sector in input and technology supplies, supporting, for example, meat, milk and poultry value-addition, it is feasible to transform the livestock sub-sector at scale and at speed, making good use of the readily available information and in-depth analyses of the sector.

Smallholder and new entrant private sector elements, can participate in the production of national priority consumption crops, oilseeds, cotton, and pulse crops. As incomes increase and wealth is created, farmers and private sector investors will acquire the necessary financial means to invest in long-term measures including mechanization, irrigation, afforestation and related activities. There will be major opportunities for Ethiopia's livestock transformation for private sector and pastoralists benefitting from improved feed and veterinary services as well as improved breeds. Improved networks of milk production and collection systems will encourage smallholders in particular and ensure quality in supplying commercial milk processing plants. There is an urgent need to modernize the milk and meat processing technologies and increase the number of skilled dairy processing and meat hygiene professionals and technicians. Incentives to encourage investment in animal production and meat processing will go a long way to meet increasing domestic demand for meat and milk, as well for to encourage export promotion. Improvements in animal health services and animal genetics that takes into account Ethiopia's indigenous breeds, including Borana, Horo and other breeds suitable for beef, should be put to work, offering immediate economic gains for

livestock owners and specialty markets. Animal feed industries must be supported and expanded, commensurate with the growing demands for animal protein and animal products.

4.6 Effective and Accountable Organizational Capacity

An immediate priority for organizational reform must be deregulation of the prevailing systems of agricultural input supplies, especially seeds, fertilizers, pesticides, herbicides, supplies of tractors and accessories, combine harvesters, and others. The roles of the federal government and regional states must be clearly defined. Motivating youth with skills training, providing start-up capital and similar steps, will serve the dual objectives of employment creation and nurturing mechanization service centers. Equally important is to consider a rollout for application of Internet and big data, based on a system that was developed to report tree planting in July 2019, to allow for accurate estimate of the demands for agricultural inputs, spatially and temporally.

It is important to put in place governance arrangements to harness synergies among government institutions, private sector actors, technologists, farmers and research institutions. Effective and accountable institutional rules and regulations, policies, programs and financial arrangements are necessary to support agricultural transformation as well as a dedicated organization to spearhead the transformation agenda. A structure of governance for transformation must be organized at Federal and Regional State level - consisting of politicians, policymakers, relevant ministries including agricultural, technologists, business partners, investors and others with interests and expertise in agricultural transformation. This governance structure must oversee conflict between traditional elements and the emerging, and progressive, institutions which will provide a transformational force. The key task is managing the paradoxes between the old and the new, and supporting innovative ways of doing business. Most importantly, one must be aware of the emergence and empowerment of diverse interest groups. One example of this was the elite elements who promoted the land grab around Addis Ababa and other major cities without adequately or proportionately compensating farmers. This underlines the necessity of having a legal mechanism in place for land valuation and to protect farmers from forced eviction.

4.7 Accessible Rural and Agricultural Financial, Credit Services and Incentives

Another priority function of the Federal and Regional States must be the creation of decentralized agricultural and rural credit banks and financial services. For policy changes to be effective and deliver on the promises of the

transformation agenda, it is critical to put in place effective and decentralized financial structures in the form of agricultural and rural development banks.

Smart subsidies and price incentives should be directed to strategic commodities that meet federal and regional priorities. These are preconditions for meeting food, manufacturing and service sector demands. They may also include cereal crops, maize, sorghum, wheat, *teff*, or barley, and pulses and oilseeds, aiming to satisfy domestic consumption as well as replace imports. Equally important, incentive systems must also prioritize the needs of the manufacturing sector, especially the principal commodities needed by the Industrial Parks and agro-processing plants. Those include cotton production for textiles, the livestock sector for meat and milk production, and hides and skin to supply leather manufacturing.

It is also important to reconsider the effect of the current imported wheat subsidy. Subsidizing wheat millers has been acting as price disincentive to local producers. An alternative subsidy approach could be to target bread consumers using income thresholds. Similarly, incentives for the production of oilseed crops would help to encourage greater domestic production of oilseeds and replace imported vegetable oils. Special and preferential price incentives must be considered to encourage the production of high-value nutrition crops and import-substitution crops, for example for wheat, oilseeds, and cotton.

Another step would be to sequence and prioritize incentives for agricultural and rural transformation by using farmers who have shown themselves ready to innovate. This could include selective incentive schemes that motivate existing capacities, individuals and farm household decisions to invest in modernization of agriculture and rural life. For example, there are a number of farmers, especially in Arsi and Bale areas, who have already accumulated experience in using tractors and combine harvesters and have started land aggregation. With targeted and sufficient incentives, they could quickly become agents of agricultural and rural transformation. New entrants to agriculture and rurally based agro-processing enterprises could also be prioritized through credit systems, technical training/ assistance, subsidies and tax exemption.

4.8. Environmental Sustainability

The most critical element of property rights discussed above is to ensure and enact legal basis to delineate and protect the natural environment, highly degraded areas, and the critical watersheds that feed into Ethiopia's numerous hydro-power plants, including the river basins that are severely endangered. The reservoir of Ethiopia's watershed and environmental systems is close to being broken irreparably. Farm size aggregation and employment of technology can finally start to slow down, and turn around, the current and continuing human-induced environmental deterioration, destruction of soils and vegetation...But

urgent action is needed to prevent crossing the threshold beyond which lies the collapse of the country's very structure and civilization.

References

- Ahmed, Abiy.(2019). Medemer -- መደመር 2012።
- ATA. (2013). “Ethiopia Seed System Development Strategy”.
- _____. (2014).“Ethiopia National Mechanization Strategy”
- Badiane, O, and Tsitsi Makombe. (2014). “The Theory and Practice of Agriculture, Growth, and Development in Africa.” WIDER Working Paper 061.
- Bediye, Seyoum, Gemechu Nemi and Harinder Makkar. (2018). *Ethiopian Feed Industry: Current Status, Challenges and Opportunities*. Feedipedia. Broadening Horizon.
- CDRC. (2019). “Poverty and Hunger Strategic Review. Ethiopia’s Roadmap to Achieve Zero Poverty and Hunger”. Center for Dialogue, Research and Cooperation. Addis Ababa, Ethiopia.
- COHA. (2013). “The Cost of Hunger Study in Africa”. A joint AU/ECA/WFP project.
- CSA. (1980). “Time Series Data on Area, Production and Yield of Major Crops – 1979/80 – 1985/86”. Statistical Bulletin 56. Central Statistical Authority.
- _____. (2015). Agricultural Sample Survey, 2014/2015. Volume II, Report on Livestock and Livestock Characteristics. Private Peasant Holding.
- Delgado, C. (1995). “Agricultural Transformation: The key to Broad-based Growth and Poverty Alleviation in Sub-Saharan Africa”. International Food Policy Research Institute. MSSD Discussion Paper No.7. Washington DC.
- De Waal, A. (2018). *Mass Starvation. The History and Future of Famine*
- Diriba, Getachew, (2018). *Overcoming Agricultural and Food Crisis. Institutional Evolution and the Path to Agricultural Transformation*. USA and Addis Ababa.
- Eicher, C and John Staatz, (ed.). (1984). *Agricultural Development in the Third World*. The John Hopkins University Press. Baltimore and London.
- Eicher, C and John Staatz (ed.). (1998). *International Agricultural Development*. Third Edition. The John Hopkins University Press. Baltimore and London.
- FAO. (2019). “Ethiopia: Availability and Utilization of Agro-Industrial By-products”. Food and Agriculture Organization. Rome.
- FAO. (1986). “Ethiopian Highlands Reclamation Study. Volume 1: Final Report”. Report prepared for the Government of Ethiopia.
- _____. (2017). “Agricultural Transformation in Africa. The Role of National Resources”. Regional Office for Africa.
- _____. (2018). “Ethiopia: Report on Feed Inventory and Feed Balance”. Food and Agriculture Organization. Rome.
- Harari, Yuval Noah. (2015). *Homo Deus. A Brief History of Tomorrow*. Vintage. Penguin Random House, UK.
- ILRI.(2017). “Ethiopia Livestock Sector Analysis”. Ministry of Livestock and International Livestock Research Institute.
- Mellor, John. (2017). *Agricultural Development and Economic Transformation. Promoting Growth with Poverty Reduction*. Palgrave Studies in Agricultural Economics and Food Policy. Cornell University, Ithaca.

- Mellor, John. (1973). “Accelerated Growth in Agricultural Production and Intersectoral Transfer of Resources.” *Economic Development and Cultural Change*, Vol. 22, Issue 1, PP 1-16.
- MOE. (2016). Educational Statistics Annual Abstract. Ministry of Education. Federal Democratic Republic of Ethiopia, Addis Ababa, Ethiopia.
- Naseem, A, et al. (2017). “Measuring Agricultural and Structural Transformation”. Selected Paper prepared for presentation at the 2017 Agricultural & Applied Economics Association Annual Meeting, Chicago, Illinois.
- National Planning and Development Commission. (2018). Poverty and Economic Growth in Ethiopia (1995/96-2015/16). Federal Democratic Republic of Ethiopia. Addis Ababa, Ethiopia.
- National Planning Commission. (2016). Growth and Transformation Plan II (GTP II). Federal Democratic Republic of Ethiopia. Addis Ababa, Ethiopia.
- Pankhurst, A, ed. (2017). Change and Transformation in Twenty Rural Communities in Ethiopia. Selected Aspects and Implications for Policy. Ethiopia WIDE. Tracking Communities since 1994. Addis Ababa, Ethiopia.
- Pankhurst, A and Catherine Dom, ed. (2019). Rural Ethiopia in Transition. Selected Discussion Briefs. Ethiopia WIDE Tracking Communities since 1994. Addis Ababa, Ethiopia.
- Staatz, John. (1994). “The Strategic Role of Food and Agricultural Systems in Fighting Hunger Through Fostering Sustainable Economic Growth”. Paper Prepared for Workshop on “The Silent Challenges of Hunger” Sponsored by USAID. Department of Agricultural Economics, Michigan State University.
- Timmer, P. (2007). The Agricultural Transformation. In the *Handbook of Development Economics. Volume 1*. Editors: Chenery and Srinivasan. Elsevier, North Holland.
- UNDP. (2019). Human Development Report 2019. Beyond income, beyond averages, beyond today: Inequalities in human development in the 21st century.
- UNIDO. (2013). “Ethiopian Agro-Industry Strategy - Dairy Sub-sector”. Ministry of Industry, Ethiopian Meat and Dairy Technology Institute, Ministry of Agriculture.