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# TRADITIONAL VS. MODERN AGRICULTURAL SYSTEMS: A COMPARATIVE GEOGRAPHICAL STUDY


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## INTRODUCTION

Agricultural systems can be classified into two main typologies: modernized and traditional. Modernized agriculture, characterized by industrial elements and values, transforms nature into an economic good, employing labor-intensive techniques. With the modernization process, production per unit of soil surface increased dramatically in terms of both output and productivity. On the contrary, traditional agriculture remained "backward" in terms of productivity and innovation. Traditional agricultural systems, which exhibit differing types worldwide, involve methods to cultivate plants and raise animals in the same way as 1,500 years ago. Two main questions arise in this regard: "What are the architectural and agronomical elements that distinguish modernized from traditional agricultural systems?" and "How much land is currently managed worldwide under modernized agricultural systems in the historical rupture view?" The answer to the first question is complicated due to intricate technical judgements of stringency or generosity. With regard to the second question, the area of land that is currently used by modernized agricultural systems is evaluated. The limit of such an approach is that it misses some historical processes.

This rough breakdown of the worldwide agricultural landscape into modernized and traditional systems is an obvious first step to enhance a deeper perception of the environmental debate surrounding the current world food crisis. The aim is to stimulate a reflection on the conversion of modernized agricultural systems towards sustainability through the return of both old agricultural systems and traditional elements. The metropolitan world, which used to have a short term food supply in the past, is now affected by many different types of food safety alarms. These alarms are strictly related with a systemic fragility of the modern food production system. A safety alarm may regard either the healthiness of the food, the way the food is produced, the excessive closeness of the food supply chain or price rising questions.

## HISTORICAL CONTEXT OF AGRICULTURE

On a world scale, agriculture has progressively been losing importance since the mid-20th century, in term of gross domestic product (GDP), share on employment, and on the land. Traditional agriculture is more and more mixed with some forms of more developed agriculture. However, due to huge agricultural surpluses produced, debate to current agriculture seems inevitable, at least in the Western World. On the one side, it is worth noticing that agricultural and rural condemnation, in terms of pollution, biodiversity losses, etc. appears to have reached a crisis point. Issues of food safety and contaminated, trust and scandals, etc. has also ranged large effect on both the consumers and the agricultural systems alike. On the other side, on the political side, international agreements such as WTO, and new "green taxes", as well as other elites' influential policies, could be gathering thoughts for stringent agricultural overhaul. All these have little to do with the modernization process of agriculture per se, and more with its current state, but may be instrumental in envisaging a future alternative agriculture (SORTINO and CHANG TING FA, 2008). On a more practical side, what seems to be desired is a soft but still "efficient" agriculture. It means, under production, but at still efficient costs. Future of agriculture is considered, postulating likely dialogue, e.g. through possible debate or scenarios.

When speaking of agriculture, a homogenized view often leading to confusion either at the sophistication or functional system reduction end of the gulf, is used. However, actual understanding of agriculture and how to product foodstuffs could be very different, ranging from primitive but interdependent and sustainable farming ecosystem on one side to the use of advanced technology such as GM crops, premium fertilizers, spacecraft remote sensing and map designing precision farm machinery on the opposite, whereby all producers contribute with the same type of excess products. In fact, the processes of agriculture modernization, by their very nature, have not been uniformly distributed and spread thus far among own operative contexts. As a result, some typologies of agriculture appear to have been somehow excluded from functional process of modernization. There are two typologies of agriculture that can be identified, namely: 1) Modernized agriculture, characterized by industrial and sophisticated techniques of production; 2) Traditional agriculture, as conceived to be based on local styles of farming more common, though not limited, to the less developed countries.

## 3. DEFINING TRADITIONAL AGRICULTURAL SYSTEMS

In the last decades, the agricultural sector has witnessed a worldwide modernization process, based on recent research advances. The resulting agricultural surplus—that is, more food products than necessary to feed the population—has not only changed societies' lifestyles but also the way they look. This modernization model, however, has met a crisis point: globalization has totally reorganized the world's economic and political balances and in the agricultural sector, as well as many other sectors, pressure accelerates towards new models (SORTINO and CHANG TING FA, 2008). Today all around the globe, traditional agriculture styles coexist with modernized ones, which largely contribute to fast socio-economic growth. For many developed countries, in this respect, Europe is a perfect case study. It is a Continent of modernized agriculture far more advanced than, for instance, Asia or Southern Areas of America; but it is at the same time a Continent of diversified traditions in agriculture, with countries, geographical areas or villages presenting specific local styles.

Nonetheless, due to dramatic differences, it is often questionable whether to describe some of these local styles of agriculture as modernized or traditional systems. In other words, it is not easy to draw a line clearly dividing traditional from modernized agriculture. There are ambiguous shades in between. Modernized agriculture, on one hand, is often related to the most fertile soils of European rural areas: France, Belgium, Netherlands, Germany's plain, North of Italy or in general areas well directly influenced by the Atlantic Gulf current. On the other hand, there is agrotechnical potential agricultural land with plenty of water like river valleys or areas with high precipitation rates that stopped farm modernization even though they did catch up on traditional systems. The former, that is (North of) Italy once again, is a good example. Typologies of farms, both modernized or traditional, based on a sound consideration of the above-mentioned frontier permits to consider several local styles of farming within both systems. This can allow to deeply understand a rage of phenomena that are often taken into account as either 'traditional' or 'modern' with no further analysis of system and local style responses differences.

## 3.1. Characteristics of Traditional Systems

Traditional agriculture is viewed generally as a backward, inefficient and unproductive system of farming. From the farmer's perspective traditional farming means an agro-ecological farming system, using low-yielding crops under a low input-low output regime and processing methods invariant over centuries, passed from elders to children. Traditional agriculture is linked to ecologically based innovation practices and implements, to traditional land-use and land-tenure systems as well as to indigenous knowledge systems. The local plants and crops are as sources of food, medicine and income but also as part of social identity. Indigenous knowledge plays an important role in agriculture as this knowledge is passed from generation to generation thus contributing to the sustainability of this mode of food production (Pauline. Maragelo, 2008).

At the core of most conventional agriculture is the plough, an implement that domestically arouses both fear and admiration. For centuries various communities fashioned ploughs of either wood or metal. In the states either a tractor or a broadcast seed drill does the work of such armoured machines on a considerably larger scale. Nevertheless, when unit size of the plough increases massively, it outgrows smaller machine systems and is perceived differently. The large machine removes any intimate and detailed contact with the land, and this becomes a technical object, a commodity, a relatively inconsequential extension of the modernising economic system. Complexity and scale do not lessen intellectual appeal, but cultural and social aspects of agriculture matter more.

An anthropological model of agricultural evolution is developed, that captures features not only of conventional and mechanised agriculture but also brings traditional agriculture into critique. Traditional agriculture consists of two parts, past experience which includes a long detailed history on many cultures, practices, cycles and systems and then local agricultural systems in which agricultural practices are situated at many geographical scales. At all scales it is continuously evolving. At the same time the more broader agricultural evolution system is described in terms of histories, practices and interactions. Together, the features of both models can be contrasted, comparing the situation and understanding at present-day modern large-scale agriculture with some semi-globalised and less mechanised equivalent systems at a particular point in time.

## CULTURAL SIGNIFICANCE

The geographic research of culture has grappled with the unique degrees of prominence that specific themes – justice, body, race, sexuality, and so forth – historically commanded in various sub-disciplines. Gender, and more broadly feminist, geography is no exception. The recent renaissance in gender research is an open summon for self-reflection, hence an invitation to interrogate the arc of gender research into and across the period of the cultural turn. The capillary workings of the cultural turn selection, promotion, and restraint have affected race and globalization research, hampering its depth and breadth – and, arguably, the avenues and opportunities it might otherwise have offered. Virtually unexamined in this respect, feminist geography deserves similar scrutiny, recognizing its particular fledgling role, with unique, undreamt-of advances and upturned blindsides. This unfolding of feminist geography may also fascinate, even as it illustrates that these talks absolve per se neither the nature nor the label, however tenable or usurpable. This is as much a research agenda for the future as an inventory of its sites of reflection to date. Cultural studies characteristically operate within, yet must bridle, the fluency of culture themselves. One liked-to-assign certainty, a "cultural turn essay", is those intellectual inspirations that turned slowly to be literary. Simultaneously, think of those "essays turn" that turn upon itself into the fervor to reflect upon the challenge posed by the textual turn to geography's ideological, scientific, and political locationalities and agents, whereas the works comprised in volume are, notwithstanding differences in male-femaleness, sometimes provokingly located and sharply vindictive of fundamentalist camps of geographical inquiry. Implyingly, in the sense of both national origin and standard of reasonableness, feminist geographers, more so than their counterparts, have contributed to each tranche of the cultural turn output, as caused cycles through the late 1980s to the mid-1990s, clean technologies and telecommunications in the second order, locational agents in the final stage of conellation. Geographers radically infused into national feminism, but the localization of feminist geographic imaginations lags the grab by years of effort, equipment study and solo, research A to scurry in hand-on mode.

## DEFINING MODERN AGRICULTURAL SYSTEMS

Modern agricultural systems are characterized by the replacement of manual or animal labor with mechanized labor, the substitution of organic for inorganic fertilizer, the introduction of herbicide- and pesticide-use, and technological change resulting from the activity of food companies, applying science to the field with biotechnology and bioengineering techniques . These changes have resulted in a huge agricultural surplus relative to middle-ages levels, stabilizing food prices between $40 and $100 for every 1,000 kcal, and a general food surplus availability for all humans on Earth. However, this model of agriculture has in turn met a crisis point, marked by the effects of some negative externalities: pollution, soil erosion, loss of organic matter concentration, groundwater pollution, biodiversity losses, habitat fragmentation, simplification of agrarian landscape and accompanying fauna and flora, increase of waste, loss of resilience, increased control over national agricultural sovereignty by transnational firms and food companies. Notably, in the last few years this system has been challenged as making food not safe. Faced with hormonal drugs used to raise animals for slaughter, water-borne epidemics originating from mass pig farms, pesticides banned in most of the world used in Mexican greenhouses, and biotechnological contaminated vegetables and crops, citizens have begun to ask where their food comes from and if it is safe. Nevertheless, “modernized agriculture” continues to be the agriculture assisted by active policies in both the EU and the US, giving rise to “the agricultural surplus and underpricing that plague farm policies”. In the EU, more than ¾ of CAP support goes to the biggest 10% of subsidy recipients; in the US, only 40% of farmers receive any subsidy, with the richest 5% getting over half of the aid. Furthermore, in countries such as Italy and France, gigantic companies control both the input and output parts of the food chain, monopolizing both citizens’ consumption and small farmers’ labor. Citizens’ food safety worries must confront national agricultural policies that are the main producers of food non-safety or unfairness. Given recent price hikes, farmers have protested against unfair price fluctuations and were given to understand by governments that they were to defend themselves through acquisitions and mergers, selling off their land to companies and shifting to conventional enhanced techniques.

### 4.1. Technological Innovations

Agricultural systems differ from each other in numerous aspects. Nevertheless, this comparative geographical study focuses on the most relevant five categories, which refer to geographic settings, technological innovations, economic conditions, cultures, and government policies. Following the descriptions of traditional and modern agricultural systems in the previous section, this section will provide a thorough comparative analysis of the two systems. Agricultural systems are complex systems that interact with socio-economic and physical processes over extensive spatial and temporal scales (SORTINO and CHANG TING FA, 2008). As such, they are a subject of major interest and concern to agricultural economists and scientists, agribusiness practitioners, environmentalists, and policy-makers. Understanding how agricultural systems have evolved and interacted with each other over time, however, remains challenging. In particular, determining the comparative dynamics of traditional and modern agricultural systems, which have coexisted and interacted recently, is a question that calls for more attention.

Traditional and modern agricultural systems differ from each other concerning geographic settings. While the former is usually practiced in coastal plains and river valleys, volcanic cones or plateaus, and tropical areas with favorable climates, the latter is mainly developed over arid and semi-arid regions where crop cultivation is impossible by utilizing irrigation and soil conditioning technologies, on hill-tops where high elevation ensures development under climates not favorable to agriculture, and in cold dusty areas where the agricultural capability is enhanced through crop seeding based on weather predictions. The topographic and climatic diversity of Eurasia makes it the cradle of two entirely different types of agricultural systems. The spread of modern agriculture across the traditional one is associated with a rapid decline of the latter. There should be an endeavor to gain a better understanding of the dynamics of these two systems. I would like to examine this/an issue in a comparative geographical study of traditional and modern agricultural systems from the perspectives of the scientific community and the political arena.

### 4.2. Economic Implications

The agricultural system has made its leap forward with a significant economic ripple. This advancement has consequently invoked a driver of economic growth. Moreover, this escalated growth acts as an avenue in achieving a higher standard of living through several prods. One in the form of low production cost expansion can be seen to be an evident vehicle. The application of chemical fertilizer, herbicides, and pesticides was one of such paths of growth. Chemical fertilizers, with their much lower production cost, replaced humus fertilizers even agricultural lands with its visible soil nutrient depletion. Herbicides and pesticides, with their broad-spectrum kill effectiveness, replaced the labor-intensive hand-weeding and treatment of plant disease. As an illustration, it is noted, in modern agriculture, chemical fertilizer substitutes yield growth retain ability as a stock input. On a per-ton-basis, chemical herbicides are less expensive than labor in planting, but in-place herbicides were more productive than per-input nerd labor in harvesting via selective pest management (SORTINO and CHANG TING FA, 2008). Thereafter, farm mechanization was also taken as an avenue to cheapen labor costs. Tractors, sprayers, and harvesters, using engines and transmission systems with enormous scaling attributes, replaced the hard work of farmers and farm animals. Within leveraging massive scaling effects, total labor employed in farm production has been hugely shrank. The economic ramifications of this techno-evolutionary cruelty ranged from farm daily earnings to regional family and community structure. Firstly, farm owners, by taking over the remaining labor force, were able to extract enormous agricultural revenue unemployed in a production created within a significant barrier of entry, to prevail wealth concentration through assets purchasing. An emblematic illustration can be seen in Chiayi County, where ever-discussed land grabbing is created via large-scaled planting conversion between local land lords. As a consequence, the local population and employment in farming have more than halved. Later on, people of the second generation in farming can be observed to mostly be unincorporated youngsters and down in fortune.

### Geographical Distribution of Agricultural Systems

Agriculture is one of the leading causes of environmental stresses ranging from depletion of natural resources to waste generation. The environmental burdens majorly arise from intensive agricultural practices and the application of new techniques in agriculture (Kumar et al., 2024). The agricultural sector is the first link in the food supply chain and provides the basis to assess all corresponding impacts in relation to other sectors. Impacts can occur in different categories including ecology, geography, soil characteristics, soil erosion and the freshwater ecosystem. Agriculture production requires large amounts of water, fossil fuels and agrochemicals, the use of which degrades the ecosystem. The excessive use of pesticides in agriculture produces both greenhouse gases emissions and water pollution. In India, the freshwater resources are getting polluted by drainage and leaching of nitrates from agricultural land due to the overuse and misuse of chemical pesticides. All these challenges are inextricably linked with food safety and this has inspired societies to discuss how best to address these issues globally. The United Nations has included health with safety and the issue of food security as a priority among its Sustainable Development Goals. The emission caused by agricultural activities has large variability due to local climate, quality of soil and agricultural practices. The consumer preference for healthier and sustainable food choices has resulted in a substantial increase in global demand for organic crops. Meta-analysis had indicated that organic crops have higher concentrations of antioxidant compounds, lower cadmium concentrations and a lower incidence of pesticide residues compared to non-organic crops. However, consumers often lack access to credible information about the environmental impacts of organic farming. Follow up studies are therefore necessary to determine if the much promised benefits of greater sustainability and lower GHG impacts of organic farming are actually realized. In this context, in order to satisfy the growing demand for vegetable production and at the same time help promote sustainable agriculture achievable management of inputs and eco-friendly farm practices has to be pursued. Quite a considerable amount of work has been done to assess farming practices and look into overall environmental impact of agriculture.

## SUSTAINABILITY ISSUES

Modernized agriculture is supported by large subsidies. Agriculture is a peculiar production sector: food is a necessity, highly significant good, and its production depends on climate, soil, and industry. In the past century, food production has increased dramatically. Nevertheless, the same improvements have not turned into a better quality of agricultural products. In addition, it has not assured a more equitable food distribution, nor food safety. In horizontal terms, in the developed continents there has been a problem of a lack of food and the reality of famines. On the contrary, in the US, in the EU, in Australia, and in Japan, the modernization of the agricultural sector, with the application of industrial techniques in the production of food, has also created a huge agricultural surplus. This overproduction is constantly disposed of and up to now little examined. However, during the last decades, the limits of such an agriculture have exploded and the modernization model has met a crisis point.

Widespread climate changes, environmental pollution of the aquifer and of the air, the enormous social costs of undesired migration, the abandonment of rural areas and physical destruction of the farming district have arisen. All these phenomena are strictly interrelated. On the one hand, modernized agriculture is the main generator of these phenomena; on the other hand, all of them are amplifiers of the crisis of modernized agriculture. Such a model has not shown the ability to adapt itself to the new situation. At the same time, it has been observed that modernized agriculture, despite its overproduction and its well-known and negative externalities, is still socially highly supported, even in the absence of economic and political legitimacy. Such an agriculture, during the last decades, has been the goal of deep questions coming from several backgrounds. Such questions have aimed not only at redefining the legitimacy and duty of modernized agriculture, but also the need for its structural changes and for its conversion to sustainability with improvements in food safety and reduced production constraints.

## BIODIVERSITY CONCERNS

Leaping beyond biodiverse cultivation strategies for sustainability Natural biodiversity of a system saves its integrity under stress conditions like drought, which have been used for millennia by farmers who learned to pattern it either consciously or unconsciously, understood by social scientists, but little understood and practiced by engineers. Tehuacán Valley, where the oldest evidence of maize cultivation is found, presents a wealth of organic land races shaped by collaboration between farmers, evolved for diverse social-ecological conditions, which can feed future generations. Research on AFS, sustainable intensification, and tolerance to erratic weather is a priority. Much research is focused on AFS biodiversity and food production and not on AFS management systems, knowledge of which is crucial to make sustainable farming practices attractive (Vallejo-Ramos et al., 2016). It implies studying farmers' rural practices, understanding cultural contexts where they developed, and their integration with biophysical environments. Rural underinvestment in AFS is driven by social-political structures benefiting industrial monoculture, accompanied by food systems undermining intergenerational food knowledge and practice transmission. Peasant hybrids prove STI potential at low-cost management. AFS-enhanced biodiversity results in higher yields with lower environmental costs, which are high for monocultures with input and oil price peaks (Balmford et al., 2018). More affluence leads to rural neglect, but diversification increases resiliency, and current 1% biodiversity loss is not a problem; addressing 20% loss to avoid collapse is crucial. Plurist agroproduction patterns make sense for cultures and environments, but funders bet on one development pattern. AFS-based approaches run on ecological principles that resist merchandising but are successful and low-cost. For some individuals, it is easy to be low tech as it is almost at hand, while for others, high investments yield ecological damages more acceptable if no other option exists. Water in soil and balance saves identification and could be converted into labor. Regeneration remains an option, but recovery from collapse is slower. Different AFS manage loss of diversity differently; however, desirable diversity remains outside technological correlation in technical matrix output/dilution. The challenge is to gather social-scientific intelligence from understanding broader context choices. AFS have tuned labor into the nail-nail lock of wind-plant-fit technologies, producing and conserving life through generations. AFS are a complex socio-ecological adaptive system built over centuries in years of learning and adaptation efforts, both cultural and biophysical. It is a puzzle of puzzles. Current agricultural uses of the system are isolation puzzles, resistance, and failure of dismantlement and failure. AFS strains commercial profit until mechanization focus diverted processors, traders, and specialists, which triggered indiscriminate mechanization, managed now with up-to-date technology. Shifting and patchwork monoculture are favored bereft of closure for the massive AFS challenge, though signal years for heritage rents and co-management losses-on-control arose. Prices on staple AF produce, e.g., maize, surged, favoring peasant production. AFS reconstruction or resilience popularly co-fundable with a 70% surplus is key. Design must balance access and targeting issues to allow participatory co-production but need to be gradual to be accepted by parties involved. Some alternatives faced economic barriers post-invasion rare, though development needs persist without being core; however, funders bet unilaterally. Tech-sustainable farming inputs benefitting firms and impoverishing users are questioned, with high biotechnology moving origins. Returned tried and abandoned knowledge is tempting but trepidation abounds; runners in the box speak.

## Socio-Economic Factors Influencing Agriculture

The differences in agricultural practices between two neighbouring communities in the Ciskei region of South Africa were investigated. The study focused on two basic questions: What products are grown? Why are these crops selected? It was discovered that the range of crops produced was identical within both communities but that agricultural practices displayed some notable variations. The relative accessibility of cultivars was found to be a major influence on agriculture. Both communities displayed traditional attitudes, but a definite trend revealing one community to be more traditional than the other was not evident. Agriculture is embedded within the socio-cultural factors and Xengxe has a more positive attitude to agriculture (L Webb, 1980). Economically speaking, the communities can be termed semi-subsistence since they do not rely absolutely on crops produced, but also on remittances. The investigation will, therefore, be centered around the adequacy of crops grown, the means of increasing production and technology, which are closely related to basic food production.

Agriculture, being traditional and essential for survival, has greatly changed over time. It is a livelihood and an occupation. Being a multi-facetted unit, it involves technology, management, products, socio-economic conditions, politics or traditions. This needs a proper system of organisation and understanding. Development refers to a multi-dimensional change, and has several facets; agricultural development concerns the resource base of agriculture, know-how, managerial and social inputs, infrastructure, governmental support, the role of cooperatives, land tenure, political and economic systems, etc. This acknowledges that the changes need to take place in all facets of agriculture.

The socio-economic set-up is a crucial factor in agricultural development. An aspect of agricultural development in two culturally distinct neighbouring communities which have dissimilar socio-economic set-ups is discussed. Culturally distinct communities residing in the same geographical environment have adopted dissimilar agricultural practices. Their comparative agricultural geography would give insights for agricultural knowledge and development, and facilitate targeting national research and extension efforts. The related comparative socio-economic systems would possibly explain the diversity of agricultural systems adopted by the two communities.

## 1. Land Ownership Models

Land Compared to Tradition and Modern Agriculture on China's Tibetan Plateau Geographical location and features of the literature surveyed The literature surveyed was published from 1996 to 2015 and is restricted to the Tibetan Plateau and its periphery because the study map of the location of articles is based on the Tibetan Plateau and its periphery. The uneven distribution of articles in space is related to the geographical features of western China. The Tibetan Plateau has been called the "third pole of the earth" due to its high elevation and large area (376,000 km2). It has an altitude of 3000 m or more, with a mean elevation of 4500 m, and is surrounded by high mountains and hills exceeding 6000 m except for the eastern and southern borders. It is semi-arid or arid in climate (mean precipitation of 500 mm/y), with more evaporation than precipitation (2600 mm/y), is remotely located in China, and has sparse population and poor economic conditions. The study area was located in the southwestern region of China. Ethnic minority populations mainly inhabit the study area, including Tibetan, Mosuo, and Naxi. Within the study area are many nature reserves. The grasslands are mainly alpine grasslands developed due to the climate and landforms. Ecotones exist on the edge of the grasslands, whereby grasslands are replaced by forests as elevation declines.

China's agricultural systems are deeply influenced by land use until the 1990s. Under the agrarian model, farming and animal husbandry were done freehold on public land and had a close tie with Earth and Climate. Cultivators believed God punished farming errors (water or soil pollution, waste of land and resources) (Lasaine, 2018). This is still seen in Tibetan monasteries that utilize old Tibetan dairy farms today. Scattered cultivation was common in Tibetan paddy land and in family gardens of Naxi. Contagious diseases never appeared in the same village. The household was collectively run in a co-operative way. Grazers moved around open grazing land according to grass quality and water sites. The Animal Epizootics Prevention Law of 1993 imposed restriction and border on grazing and grazing land. Nomads regard it as the cause of all problems. Simple Ownership patterns shape traditional agriculture, while diversified ownership formats are found in modern agriculture (Horst, 2019).

## 2. Labor Dynamics

Modern farms comprehend the global market and sell their products based on worldwide conditions. Inputs in traditional farms are determined by custom, market conditions of the area, and state agricultural policy. Laborers in traditional agriculture are bound up with the family and take their own food from the production of the unit. Money might only sometimes exchange hands. Farm loans are obtained through personal preferences. In modern farms, laborers mostly do not belong to the family and work for a fixed amount of cash. They sell their labor for determining their own food and purchase it from non-agricultural employees in town. Many input services in western agriculture are solvable through banks. Consequently, most activities of modern farms occur off the area of production.

Alternative markets in traditional agriculture are mostly dependent on other agricultural units, taking their money mainly from farmers. In modern agriculture, markets also connect with processors and trade products of industrialized countries. Accessibility and turnover of production inputs are dependent on supply-creating units in traditional farming. In modern agriculture, supply units also trade inputs produced through industry and have access to national and foreign production units. The area available for modern assembly is often wider than traditional farms. Such units in various provinces create huge economies (Dobbs, 1993).

## Case Studies: Traditional Agricultural Systems

To understand how agriculture shapes landscapes, this chapter will provide a brief introduction on some traditional agricultural systems that still persist in various parts of the world. The cool-temperate meet of the Scandinavian Peninsula, where shifting cultivation and pastoralism are still actively practiced, will be studied to represent a traditional agricultural system for the temperate zone. The subpolar region is characterized by many lands that remain largely undeveloped by industrial powers. A case research is performed on the interactive system of semi-nomadic reindeer herding and lichen growth in the tundra of Modern-Day Arctic Russia against a backdrop of rapidly changing social and economic conditions. As for the tropics, terraced rice farming in the 3200-ha spread of Jatiluwih in Bali, Indonesia, where the unique religious system jointly ensuring sustainable water-sharing practices is the subject of this chapter. Finally, maize-hill farm-forest agrarian systems in the hilly parts of the western Ghats in India, one of the 25 global biodiversity hotspots, will be presented as a relevant traditional agricultural system for the coral region (SORTINO and CHANG TING FA, 2008). Traditional agriculture is alive and thriving in many areas worldwide, although it is increasingly marginalized in many places by industrial forces. It is precisely this modern agricultural system that utilizes mechanized machinery, synthetic fertilizers, and pesticides as important inputs with newly adopted production practices. Such modernization of agriculture has a paramount importance in its wider economic growth. Agriculture was a determinant factor that gave birth to early cities by generating food surpluses in the Fertile Crescent. It has considerably enhanced carrying capacity for the industrial revolutions in Europe and America, lifting human beings from subsistence existence to modern consumer societies. Meanwhile, a huge agricultural surplus has been created worldwide by modernized agriculture. Accordingly, by consuming food and fiber now over 140 times those in 9000 years ago, and today's megalopolises are roughly 8000 times larger than the Neolithic city of Jericho, settlements within cities have also been considerably diversified (Pauline. Maragelo, 2008).

## 1. Indigenous Practices

The purpose of this paper is to compare modern and traditional agricultural systems. A geographical perspective is used to understand agricultural practices. Generally, an attempt is made to outline the aspects of agriculture which make it susceptible to computer modeling. These aspects are utilized to formulate an overall research framework for computer modeling in agriculture. In addition, it is illustrated how the proposed framework is put into practice in two agricultural modeling projects which are at different stages of completion. The adoption and widespread application of modern agricultural methods has arresting implications for environmental conservation and rural employment. However, it is asserted that modern agricultural methods in Africa, as elsewhere, can be either sustainable or destructive. They can be sustainable or beneficial when their application dovetails with indigenous agricultural methods. Such a blending of the local and the modern heralds a plethora of commitments. An empty play field for wealthy farmers excludes smaller scale producers, the latter cannot compete successfully since they have no access to inputs, machinery or services. Without the requisite technical or financial resources, new legal environments will stifle even the more traditional farmers whose livelihoods stem from a cash crop or cash livestock production. Entire communities where agriculture plays a key role may suffer severely.

The research findings show that traditional agriculture is an effective means of food production that is not taken seriously enough by policy makers. Many examples of indigenous checks and balances exist for all aspects of agriculture and can be modified to fit into modern agriculture. In terms of inputs and outputs, traditional agriculture has a net benefit. Only for transport to towns does traditional agriculture have a disadvantage. Traditional agriculture should be examined in order to determine where modern agriculture can improve production by learning from indigenous methods or by modifying indigenous practices to fit the new agriculture paradigm. It is understandable that many traditional practices produce little or no surplus and are considered inefficient, but they are nevertheless ecologically sound and sustainable. Traditional agriculture reflects a thorough understanding of local conditions and indigenous knowledge plays a major role in agricultural production systems as this knowledge is passed from generation to generation thereby contributing to the sustainability of this mode of food production (Pauline. Maragelo, 2008). Indigenous knowledge plays a major role in agriculture production systems as this knowledge is passed from generation to generation in a non-documented form and is thus, sustainable.

## 2. Community-Based Approaches

Though traditionally regarded as primitive and backward, research has increasingly acknowledged traditional agriculture's sophistication (Pauline. Maragelo, 2008). It plays a vital role in food production and security, household income, and resource conservation in many developing countries. Through selecting local varieties, employing agro-ecological methods, and using minimal external inputs, traditional agriculture has ensured food production over generations. Women significantly contribute potential agricultural resources in this system. However, with globalization and changing economies, traditional agriculture is disappearing, implying that agricultural science and brown revolution should recognize and include potential traditional agriculture practices towards food security.

Traditional local maize varieties are the most important genetic resource in palpebes, eastern Botswana. Recognizing this importance, farmers use maize genetic resources in various innovative ways to adapt to climatic changes. Social changes and maize price fluctuations influence indigenous practices and community-based management methods of farmland and wild maize genetic resources. Along with formal maize breeding programs, traditional maize genetic resources continue to be utilized but are facing extinction and erosion of management in the community.

A better understanding and recognition of these management strategies would enable the empowerment of farmers and sustainable utilization of this vital resource for future generations. Crop genetic resources are crucial for food security, economic development, and environmental sustainability. Farmers have developed informal systems to select, adapt, domesticate, and manage crop genetic resources to address their environmental conditions, food security, and cultural needs. Agroecological zones represent unique subsets of the earth's environments, with landforms, climates, and ecological communities featuring specific patterns of soil and vegetation. These physical characteristics create different environments that impose limitations and opportunities for human use. Each of these conditions presents a different probability of occurrence and level of stress and risk over time. Traditional crops are often regarded as second-rate crops and resources throughout the world.

## Case Studies: Modern Agricultural Systems

The environmental impact of large-scale monocropping of crops cultivated in great plots by both agricultural multinationals and huge cooperatives is amplified by mechanization. The soil is drastically typified due to the exclusive cultivation of a specific type of crop and heavy ploughing activities. It is estimated that the soil has lost more than half of its organic matter in just fifty years, and it is impossible to cover any excess of these lost nutrients. In fact, soil conditioning is continuously assured by the exclusive use of fertilizers at much higher values than it could access naturally. The need for fertilizing products has generated the specialization of corporations in the agricultural industrial field. In other words, there are companies that only produce mineral fertilizers and produce a broad filtration of herbicides, fungicides, and insecticides testing their own vendors. These multinationals can negotiate with certainty the ridiculous prices at which to sell then it is well-known that agricultural prices flow to make farmers poorer and poorer.

Machines replace productivity in fields. Most are local producers, but there are brands that dominate the international market reducing the chance of farmers to negotiate decent prices. The reduction in labor productivity has been quite substantial: back in the 1962 data showed a labor force fifty times lower than in 1950 for any ton of corn produced. Accounting for differences in productivity techniques, two hypotheses can be elaborated. It may be asserted that a significant gap in productivity exists between the most modernized and the second group of least modernized countries, where dry farming is mostly pursued. It may also often be found that a significant gap in productivity does exist between farms of a modernized type and mechanical equipment from the share subsistence of smallholdings sowing a one-tenth or less for the same crop of corn in the province of Buenos Aires. Then, will examine the calibration of these differences, in terms of amounts of labor-state employed, of machines operated, and of fertilizers consumed.

A first step in this respect is to reconstruct the proportions of the observations as of States and Type of Farms. A proportion of observations per country is compulsory both for fairness's sake and for accuracy reasons. States as homogenous as Ohio, Michigan, Iowa, and Illinois were equalized with Chile as a whole, where the sample amounted to only nine observations altogether. The priority given to provinces as homogenous spaces would have cut Africa.

## 1. Industrial Agriculture

Industrial agriculture systems are characterized by industrial elements and values. Typical features of industrial agriculture include the use of industrialized farming methods, mechanization, inputs of non-renewable natural resources, monoculture, and specializations. Farmers are considered as producers and determinants of agricultural yield. Industrial agriculture is used particularly, but by no means exclusively, in northern temperate areas of the world, especially in the US and Europe (A. Frison, 2016). Socio-economically, the farmer is expected to opt for the profit-maximizing farming practice. In other words, the agronomic status of a plot would be determined by productivity and maximization of free market benefits. Crop rotation, fallow land, diversification of product or protein sources, insurance for pest resistance are avoided as they yield lesser return in the short run. The philosophy of industrial agriculture systems is that farming must give maximal yields to ensure food affordability for the ever-growing population. Governments in developed countries must support farmers in generating sufficient agricultural surplus, for two key reasons. First, underproduction of food will lead to famines and widespread panic among citizens. Second, oversupply of agricultural goods is necessary to have a stable market for products and an internal urban economy. The innovation-induced livestock/vector-poor feed-protein crisis is one of the mechanisms by which industrial agriculture led to maximum degradation of agro-ecosystems, biodiversity depletion, climate change, etc. Hence, the vulnerability aspect that the agronomists neglect or file away as unfit for 'scientific' publication is looked into. The unsustainable industrial agriculture systems model is simply not feasible in tropics/tropical regions due to socio-physical climatic, ecological, and livelihood aspects (SORTINO and CHANG TING FA, 2008). Industrial agriculture systems are impediments to alleviate poverty and hunger or malnutrition due to differential coping strategies of different socio-economic groups.

## 2. Precision Farming

Precision farming can be termed as increased digitization of farms adopting modern information technologies and farm management practices. It can be defined in a broad sense as well as in a narrow sense. In the broad sense, it can be called as crop management practices. The main aim of precision farming is to increase productivity, while taking care of environment, minimizing production risks, maximizing farm profit, etc. Monitoring of farm field variability is compulsory to implement effective management practices, which can be achieved through use of modern equipment (R. RAVIKUMAR).

Crops, water, nutrients and pests present variability across time and space. This variability is mainly due to soil variability, rainfall variability, irrigation scheduling, etc. Timely and accurate information pertaining to above factors enable more efficient management of inputs (Webber et al., 2019). Over application of inputs increases costs and contaminates natural resources, while under application causes reduced income. The time and intensity of management practices depends on variability of factors. Hence, implementation of precision management practices is a tricky task as required spatially referenced information is not available. Necessary efforts are required to incorporate modern sensing and mapping systems with existing record keeping systems and further develop decision support systems (DSS). Efforts should also be taken to explore the scope for cooperation between growers, input suppliers and vendors towards effective technology transfer.

Modern agriculture is difficult to play a multifaceted role of food producer, poverty eradicator, legitimate income house, natural resources steward, employment house and export earner. Modern farms are number limited but size increased greatly, adopting high-yielding crop varieties and bold farm mechanization. These drastic policy changes coupled with climate variability and increased population growth have put tremendous pressures on the existing natural resources on one hand while benefiting farmers, food security and enhanced export earnings on the other hand.

## CHALLENGES FACING TRADITIONAL AGRICULTURE

At present, human survival and sustainability are notable issues demanding socio-political attention. While change in lifestyles, habits and therefore diets is an obvious imperative, adjustment in agricultural methods and techniques both in the developed countries and in the developing world is more difficult to undertake. Moreover, the interest for new approaches to agriculture is sometimes ideological provided that imperatives towards the land and learning how to cultivate it are sometimes taken to the social extreme with the intention to eradicate pollution and repression along with poverty. In spite of all the problems, it must be recognized that local knowledge and practices of Agro-ecology, Organic agriculture and Permaculture have significant chances of success if adequately supported. The difficulty met by initiatives in favor of sustainable agriculture is the fault of risk adverse administrations more concerned with investments that can provide clearly measurable contribution within a limited time frame than on clearly moral reasons. In the modern agriculture paradigm, as a result, any concern on such scarcities conditions is treated as fringe or alternative, with the virtue of sustainability reduced to a fashionable or 'green washing' position of little or no concern on the side of the world's leaders (SORTINO and CHANG TING FA, 2008). Traditional agriculture systems have been sustained by cooperative societies and in the pre-colonial time agricultural activities permitted the survival of the people. At independence, the governments diverted rural productivity during the late 1960s to early 1970s known in the 1970 hymns of AGI, consequently the failure of the cooperatives drifted rural production by relying on offices-entrepreneurs. Following inappropriate policies, compounded with semi-globalization, deforestation started in the late 1980s and now rainforest and biodiversity destruction by virtue of modern technology. The fallacious policies and techniques prospered until the beginning of the new millennium. New agricultural policies towards the sustainability in western countries were formulated with the concern of Gîrbov.

### 1. Climate Change Effects

It is now widely accepted that climate change is taking place and that agricultural systems will be affected as a result. With climate features that are both constant and erratic across time and space, this is particularly critical in sub-Saharan Africa, where developing countries heavily depend on climate-sensitive agricultural systems. These countries already produce substantial food insecurity against a frail socioeconomic environment, and it has been predicted that they are particularly vulnerable to climate change and that adverse impacts will be acute in the future (Kachulu, 2018). Expected increases in temperature levels are predicted to negatively affect agricultural output, lowering output levels and animal protein crops producing countries' national incomes, whereas changes in precipitation are expected not to influence output levels.

Research about the effects of climate change on the agricultural sector has been conducted in various aspects. Biophysical modelling approaches are applied where crop growth is modelled and results about crop productivity and land use are extrapolated to the economic domain at a relatively flat level of geographical aggregation. These models have great detail and have been subject to thorough validation for deterministic simulation purposes, but they typically lack detailed treatment of farmers' decision-making processes and certainty of farmers' behaviour as a response to agro-climatic change. Such detailed agent-based modelling approaches are available, but they have often been subject to relatively simple evaluations of the effects of climate change on agricultural output while not offering computational treatment of global economic effects and sensitivity to uncertainty analysis.

## 2. Market Pressures

The modernized agriculture is perceived presently as the best solution for feeding a growing population. The question of food, which at the present time appears to concern only the Third World Countries such as Egypt, whose agricultural systems have remained essentially medieval, is the same question that utterly agonized and suffocated with logic the nowadays richest Nations such as the United States and Japan, the thousand year-old problem of the lack of food and the reality of famines. These are precisely the instances when it was affirmed that no one could consider to perish, because there was the absolute convinced practicality and certainty of Capitalism of the pouring riches of abundance that should ultimately dispense. The modernization of the agricultural sector has also created a huge agricultural surplus. The overproduction could be destroyed or undersold on the international market with unfair dumping policies. The European citizens, instead, pay twice the agricultural support: as contributors and as consumers. The modernization model of agriculture has therefore met a crisis point. At the same time, modernized agriculture does not assure food safety. The modernized agriculture, despite its overproduction and negative externalities, is particularly supported by agricultural policies. It is well known that in more than ¾ of support goes to the biggest 10% of significant beneficiaries of subsidy recipients. The distribution model is even more distorted: only 40% of farmers receive any subsidy. It is evident that farmers, in view of the distortions, produce more than required by citizens. The research and investigation activity on the traditional agriculture focus not only on the hypothetical fertility thresholds but also on the ameliorative ecological inputs that took place in the different points of southern Europe.

Two rough deterministic and very simple disagreement spaces are evidenced on the basis of an historical analysis of European agriculture until the present time. Theory states that for a quite big and fertilized rural area in which a non sustainable agriculture is established, two ways for a sustainable agriculture are proposed: one is the current reform in which the offer and revenue are treated on the same squared basis, the other is the example of organic agriculture in which a high input of Land Improvement and agriculture is required. Such agriculture typologies should neverthelesse conciliate natives in their environmental support. This conclusion has to be generalized and extended to wider areas considering both these contradiction spaces and their domestic or extra domestic foundations.

## CHALLENGES FACING MODERN AGRICULTURE

Agriculture in most countries is changing rapidly as some traditional systems converge with more modern methods while others are left behind. Most are modernizing but not necessarily in a uniform or universal manner. In poorer contexts, the challenges of modernization can be acute as we have noted in terms of population density and land degradation. Note that the processes of modernization of agricultural systems have by no means been uniformly distributed globally (SORTINO and CHANG TING FA, 2008). A world map of the agricultural systems shows how some areas such as mountainous agriculture are entirely excluded from these processes. This shows the geographic concentration of industrial systems and some of their elements while much of the globe still works with pre-industrial methods and is likely to continue to do so.

Agri-food systems in high-income OECD countries have undergone or are undergoing profound changes. Agricultural production has intensified, it has become more concentrated in the hands of increasingly fewer larger firms, notably but not uniquely in terms of large farms, and agri-food supply chains have become longer. Farmers are expected to provide food safety, quality and nutritional effects and are confronted with rising consumer power. Public affairs efforts to provide decision makers with clarified concepts of safe food are challenged by market power through public relations efforts directed at diverting the attention from questions concerning the product itself under the assumption that safety is primarily a theme within the scientific and political domains of public life.

### 1. Resource Depletion

The agricultural system under analysis has faced severe criticism for its role in resource depletion (SORTINO and CHANG TING FA, 2008). The impetus for the socio-political reform and modernization of agriculture came in response to overpopulation, soil depletion, deforestation, and water scarcity. Over most of the Earth's surface, vegetation had to be removed—together with the soil's organic matter, which was returned to the atmosphere in the form of CO2, mainly in the tropics, where most of the lost organic matter had originally been. As a result, worldwide crop production increased at a faster pace than the area under cultivation. In the post-World War II period, the agricultural revolution came as a complete surprise. The price of food fell, and the population was fed. Fertility had returned to the soil, and there were no more major famines in the countries that had undergone the reform. The last famines had been in India, in Asia Minor, and in China.

However, with modernization of agriculture came the pests. In the second half of the 20th century, the question arose as one pest after another devoured the harvest. Chemical control was mounted, and the fertilizers were to be poured into the soil to favored crops' transformers and on which insects were quick to pass on their virulence. Water supply means of modern agriculture were elected almost exclusively by man: hopelessly overexploited lakes, rivers, and aquifers non-replenished for centuries. Farmers sink ever-deeper wells into the unrenewed reserves. Tracts of land are watered industrially; the green poison pours on to court yards, clouds glow in the air, and the atmosphere shimmers with electric discharges of poisonous molecules. The crucial non-renewable natural resource for the next farming revolutions—rock phosphates—is already running out. In patches, even the donkeys are grown victim to aphids only by import of shortly run-out stock-grain phosphorus. Laid bare are the man-made creations: cities, the greatest antiquities, are ground to dust. Given the new operation of land clears and waters, the invention of fire has to be put up again because now the prime substance must be found and produced in a form that is noble enough for cornering the market of nature.

### 2. Pollution Issues

Pollution problems are essentially linked to agrarian schemes and there are several prejudiced methods, which do not work the same way for all regions and need to be assessed based on their specific environmental and socio-cultural context. Though the discussions on farming are essentially concerned with "human-nature" interactions, the science of agrarian systems can also be analyzed within a psycho-social framework through the interface of linguistics, logic, cultural anthropological theories and, habits of thought. Due to increasing urbanization and movement of people to cities, a big demand on food crops arose, which led to the intensification of agricultural practices (Ribeiro Romeiro and José Abrantes, 2008). After 25 years of speculation and investments on mechanisms and chemicals to grow food, industrialized countries still pursue others for remaining plant and animal protection methods. Enough toxicologies are around to keep captive the public health policy with no evidence or plausible assumptions of food, water or air contamination, but too much knowledge is there on how soaring urbanization tempts against vital ecosystems in high density, polluting, and temperate climates. Its immediate effect is already observable in the mega-cities where protracted nightmares in the shape of smog and destruction cope with the promise of development, affluence and democratization of opportunities.

Both water-wise policy and mitigation strategies had already been designed as the environment warmed and drought affected regions where agricultural activities were sustained for centuries, without untamable plagues or floods during harvest and transport. Adapted phytogenotypes were tested as herbicides and pesticides spread and combined with the devil-sophistication of laser irrigation automation, and machinery. With such new and modern prairies, land lushness came in the shape of plagues as new peddlers of events of catastrophe both perceivable and (un)imaginable. Processing and distributional technologic has been vastly available, but an infrastructure of services to provide them has systematically been omitted: either on a blind, ghost-like government or on ill-willed, addict cheer-leading mega-corporations at hand those decisions are taken and actions are put into exercise, without refrigerating thoughts of costs in carbon traces on lethargic, Nora.

## POLICY IMPLICATIONS AND AGRICULTURAL GOVERNANCE

Agriculture is the backbone of India and the foundation of its economy. Agriculture accounts for 60 percent of employment and 39 percent of the country's Gross Domestic Product (GDP). Traditional and modern agricultural systems are compared in this research. Governance modes in agrarian sustainability significantly impact investment decisions. Politically motivated state intervention was found to have a good impact on sustainability. Traditional agricultural systems are far easier to develop, especially in developing countries. Similarly, due to the rapid advancement of science and human resources, modern agricultural systems are difficult to control but are easier to develop (Ianouchev BACHEV, 2018).

Agricultural governance is a new term that defines the choice of one or a set of methods for pro-agricultural policy implementation. It also defines the coordination and cooperation levels between different subjects according to classical economic theory, as well as new theories in polycentric governance.

Research about agricultural governance is young due to the newness of the problem and the lack of adequate long-term experiences and data. Furthermore, agri-environmental problems and efficiency of local resource management are typical themes of research, however, on-going research focuses on the concept of agricultural governance. Most studies focus on formal governing modes such as regulations, strategies, and state intervention, neglecting important informal institutions, arrangements, and organizations.

Sustaining development is the core aim of agricultural policies. Thus, understanding and assessing agrarian governance and its impact on sustainability is of great importance, both for the scientific comprehension of spatially and temporally diverse systems, and for effective assistance to formation of public policies and strategies, which is also major concern of modern economics. A methodological framework to assess the impact of different agricultural governance modes on agrarian sustainability is outlined as well as an illustration of it is provided in the context of the Bulgarian agriculture.

### 1. Regulatory Frameworks

UN's 2030 Agenda for Sustainable Development emphasizes a sustainable and resilient world, with the 17 Sustainable Development Goals (SDGs) guiding human prosperity while safeguarding the planet. Sustainable Development Goal 2 (SDG 2) targets "End hunger, achieve food security and improved nutrition, and promote sustainable agriculture". However, the modernization of the agricultural sector has created a huge agricultural surplus. This surplus is due to the technical progress in the production process, as excess outputs have to be sold at a too-low or zero price. This situation is followed by the evolution of a price structure that entails production disturbances, as (SORTINO and CHANG TING FA, 2008). But in this case, the modernization model of agriculture, even if horizontally narrowed to rich Northern countries, met a crisis point due to pollution or biodiversity losses.

The latter point is particularly critical, as often negative externalities caused by modernized agriculture do not assure food safety. On the other hand, it is worth noting that modernized agriculture, despite its overproduction and negative externalities, is particularly supported by EU and US agricultural policies. In the EU, more than ¾ of CAP support goes to the biggest 10% of subsidy recipients. In the US, only 40% of farmers actually receive any subsidy, and among them, the richest 5% get over half. Farmers, in view of the CAP distortions, regardless of production conditions, produce more than required by EU citizens. The overproduction could be destroyed or undersold on the international market, adopting unfair dumping policies.

### 2. Support for Sustainable Practices

The EU and the US are definitely the superpowers of this modernized agriculture and simultaneously they show a lot of contradictions. They own huge and ever growing food companies that work at a loss to the citizens. With a complexity detouring the real intentions and implying multitude of expectations, with lobbyists, artificially created crisis, pollution and price rise in all sectors, the west suggests itself as the most enlightened servant of the world agriculture. However, trivial food problems are rising from different expectation contrary to fundamental EU and US commandments such as “food is in no way an object of stockpiling or speculation.” It is clear that modernized agriculture worldwide is in chronic crisis, and the open questions are the now well-known consequences of the farm crisis and the future scenario for agriculture. The main instruments of EU and US policies in support of modernized agriculture are the subsidies based on the so-called triangle effect. These practices in a world where the poor and destitute are at the edge of hunger are apparently ridiculous and patently hypocritical.

The present clear benefits are felt only by the more developed and sound economies. While first of all, with reference to both the EU and the US, it is clear that this food safety nor these apparent best solutions are amongst the priorities of the politicians. The Long term Food and Agricultural Policy can only implicitly consider the impacts of climate change in agriculture scenarios. Consumption and nutrition are not prioritized yet at the EU and USA levels. In both cases, feed is prior to food, consumption inefficiencies are hardly addressed, and the agriculture industries, mainly the food ones, can move to evade difficulties. Moreover, continuous increases of compulsory HACCP and standard regulations suggest food safety, it is worth completely abolishing these controversial and cost-inefficient regulations. And while it is well known that a financial turn-around is a must, it seems that agricultural policies in the conventional food sector can hardly be reviewed in terms of dirt investments, stockpiling capacities and storage rates at the processor level at least in the near future.

## FUTURE TRENDS IN AGRICULTURE

Global population growth has been widely discussed in recent years as leading to a scarcity of resources, and the following question has arisen: will the current agricultural production be able to meet the need for food? Probably, the greatest rise in food production will happen in those areas of the world still using traditional agricultural techniques. Farmland in the developed countries will not be able to keep pace with this rise because of a lack of available land, while soil degradation and environmental pressures make it very unlikely for these countries to further develop their agriculture (SORTINO and CHANG TING FA, 2008).

A correct assessment of sustainability is needed in the analysis of global agricultural growth. However, clear guidelines for such a sustainability assessment are extremely difficult to define, and different opinions are likely to lead to the construction of different scenarios. On the one hand, according to a pessimistic view, the globalization of the ‘modern’ agricultural production system is inevitable and traditional agriculture will be 'phased-out', leading possibly to a general world wide collapse of all structures that have a regional character. The most developed countries will grow much of the food, and those regions still practicing traditional agriculture will mainly be reserved for preserving a way of life and tourism. On the other hand, a more optimistic assessment assesses a schismic behavior of agriculture. After long decades of falling prices, a situation could arise in which the stronghold of the 'modern' agricultural production system will enter a period of crisis and food security will return as a major issue in society. Most probably, the guaranteed food stocks of the 'modern' agricultural system will then be depleted and traditional agricultural techniques will be rediscovered, improved and integrated into the global market. Either way, a dramatic change of agricultural practices and production systems is expected in both the 'modern' and the 'traditional' agricultural systems, and therefore a comparative analysis is required to understand the mechanisms, their interdependences and their impacts.

Such an analysis would rely on assumptions on (1) the economic drivers behind the current rise of agricultural prices, (2) the dynamics of traditional agriculture's stand against these drivers, and (3) the induced structural changes in both the modernized and traditional agricultural systems. Then, parameters can be defined to compare opposing scenarios and to analyze how they give rise to evolving structures of production. An appealing mathematical tool is systems dynamics, as it can be used to express complex and intricate structures as a set of differential equations. It can also be applied at descriptive level, which enhances the adequacy for simulation studies as it makes low mathematic skill requirements. Finally, the explicitly time dimension allows understanding and interpreting cases more transparently than discrete system approaches. Such an analysis can be applied at different geographical scales. A readily applicable way is to use a focal country, while a first attempt could aggregate the EU as one system.

## 1. Technological Advancements

Modern technology has tremendously transformed various fields of human endeavor, from communication, transportation to the health sector. In the same way, the agricultural sector has not remained on the sidelines, but with regards to agro-technologies, it has undergone gradual and full one step transformations, particularly in the last six decades (SORTINO and CHANG TING FA, 2008). Since the end of World War II, agricultural technology has come to be dominated by modern advances in technology. As tools that are used have become more sophisticated, a great deal of scientific advancement has also transformed the agricultural sector. It is well known that new technologies, particularly modern tools of agricultural attainment have increased the production of agriculture tremendously leading to agricultural surplus. In recent years, many scholars have made a substantial contribution to determining the technological advancement as a key explanatory element of agricultural productivity.

As modern agriculture's reality, not only has a huge agricultural surplus been created as a result of modernization of agricultural technologies, but the modernization model of agriculture has also reached a crisis point. These crises may arise from the soil side (pollution, degradation, salinization, nutrient depletion, biodiversity losses) or from the socio-economic side (agricultural devastation, land expropriations, price crashes). These negative externalities of modernized agricultural systems presently heavily dominate the social agenda. It has been noted that modernized agriculture does not assure food safety; one can mention some famous cases of ruminants' bovine spongiform encephalopathy (BSE) or avian influenza, where the technical processes of modern agriculture played a role in scaring humans. Therefore, in the absence of the modernization process, traditional farmers would not lose their lands, prices would converge to costs of productions, the environmental footprint would be lower, and food safety guaranteed. Despite these negatives, it does seem that modernized agriculture is still favored by EU, US agricultural policies.

### 2. Shifts in Consumer Behavior

Consumer behavior has shifted in recent decades in a shape and style popularized by cultural movements such as the counterculture movement of the late 1960s and '70s. The other side of this movement, a consumer rebellion against modernism, has traditionally been associated with lifestyle choices such as natural health remedies, movement towards rural living, and consumption of organic products. More recently, another reclamation of the rustic from modernity is taking place in the form of appreciation for the ancient foods of culturally forgotten societies. This narrative argues that all post-modern societies have lost touch with their ancient ethnic identities, and that a move toward rediscovering these cultural universes will wash away the chemical-based additions and fragmented food knowledge imposed by modernity (Snyder, 2012).

Consumer knowledge and approval of production symbolize consumers' attempted imposition of order on the chaos of modernity by asserting the rustic. However, businesses that use production images for self-promotion merely capitalize on this consumer desire for awareness and approval of industry techniques. Most people do not grow or raise, harvest or process their own food, making knowledge about food a scarcity. This dependence on industry is the norm of global food systems. Arguably, it is a lack of experience that gives the images of production a romantic yearning. Hence, food businesses that market their practices seek to sway belief away from the notion of post-modernism as a universal condition. As one individual described their consumption, it is "against the system," highlighting a desire to regain control of a life which has seemingly become automated. So-called "value-added food" businesses evoke a peculiar narrative. They challenge the dominant understanding of modern food production as efficient and cost-effective. Foodstuffs with enhanced market value, like artisanal cheese or heirloom vegetables are pushed into the public via consumer outlets such as farmers' markets and specialty grocery stores. Value added food producers must assert the benefits of their products to a group of consumers willing to pay their premium. In doing so, however, there lies a predicament. They must deemphasize economics, on which it can be argued that the entire value-adding process relies, and lend importance to alternative production practices appealing to the consumer's desire.

## COMPARATIVE ANALYSIS OF AGRICULTURAL SYSTEMS

To compare agricultural systems it is necessary to define the characteristics to be used as criteria for the comparison, collect data pertinent to these criteria, and analyze the data to derive measures of production, economic, and energy impacts of different agricultural systems.

Many of the inputs and equipment used in American farming systems have been developed by the land grant universities. This research, however, appears to be irrelevant or only incidentally adaptable to the needs of most of America's farmers. Heavily subsidized mechanization, including public investments in machinery and engineer personnel, has led to equipment which is beyond the farms' capability to adapt. Though basic mechanization research continues, public subsidy of extensive mechanization has weakened the competitive position of farmers relative to the producers of machinery, fuel, and fertilizer, bankers, real-estate companies, and suppliers of seeds, chemicals, and herbicides. This has been reinforced by research which has focused on chemical, seed, and fertilizer inputs as well as better ways to harvest and transport crops rather than on the farming systems themselves. As corporate influence increases and farm numbers decrease, University research is being directed toward "alternative marketing systems" and direct production input technology . Such input intensive technologies further concentrate realtime decisions in non-farming firms and increase the share of agricultural activity in the input and marketing sectors to the detriment of the farming sector. As this transfer occurs, equitably-accessed technologies that benefit family farmers reside at smaller scales and development efforts cease.

Despite this emerging reality of dwindling power for family farmers, some existing research does suggest that smaller farms can increase their productivity and economic competitiveness without growing larger. Management intensive grazing systems in Louisiana and southern Wisconsin have increased the percent of forage utilized resulting in an increase in livestock units without an increase in land. This is accomplished by rotating the cattle from paddock to paddock resulting in a high stocking density for short durations followed by a long rest and allowing forage to regrow. There is growing interest in this system's economic viability as smaller farms convert to run dairy herds without increasing their physical size. Management intensive grazing is perceived by some farmers as an alternative to for increasing milk production. Iowa farmers direct marketing vegetables to consumers for higher returns gross as well as net and positively impacting the rural community have been able to maintain operations. Only on farm research can demonstrate the production, economic, energy efficiency, labor, and environmental returns to these farming systems compared to more chemical dependent alternatives.

## 1. Strengths and Weaknesses

The theme of this chapter is the comparison between the two agricultural systems. Specification of the systems is carried out through the definition of the parameters which show the differences. Those parameters are: (1) crop rotation, (2) tillage practices, (3) fertilizer application rate, (4) fertilizing practices, (5) structural characteristics of the farm (field sizes), (6) pasture utilization, (7) cultivation of permanent plants, (8) reinforcement of economic objectives, (9) attention to special, sensitive areas, (10) additional objective of controllable investments. The two systems differ in each of those ten parameters. Nevertheless, in one of the systems (here called "modern system"), some items can be quantified, while in the other systems (here called "traditional systems"), this is impossible. Only qualitative any good indications are available. Those considerations lead to the conclusion that it is impossible to search for a Pareto-optimum solution for both systems at once. Instead, two independent searches are carried out. One control system for the new technology and another one for the old technology are specified for doing so (SORTINO and CHANG TING FA, 2008). Each of the control systems has its own mathematical model (optimization models for respectively questioned-inputs and booked-output). The town of Blair requested for a management plan for the bomb, or ordnance, incineration facility. The technique suggested required information concerning the incinerator and local conditions. At this instant this information was not available. Also, the two available planning resource group techniques were against the interests of Ottawa County (K. Olson, 1998). The procedure consists of four elements. The technical input-output table is unclear. Therefore the input-output multiplier estimate within a separate model.

A bi-objective optimization terminology is chosen, aiming at elucidating optimality differences. The search for again cost-optimal capacities and sizes with the modern technology is approached in three steps (1) the quantification of the engineering-technical performance parameters, (2) production and market quote assessment via bi-quantization, and (3) a continuous qualification for rationality. The simulation program of the traditional system is being applied to the modern one in order to check its applicability. Almost all parameters must be redefined in new ways. To what extent can the recommended dosing strategy eliminate the available waste/turnout loop? Analysis reveals that the above supply management must be extended to waste utilization management. Suggestions for further research are concerned with this management. Basically possibilities go in three directions (1) investment extensions must be (re-) assessed, (2) results of local staking of residues (costs involved) must be included, and (3) several computer-coding-simulation chains must be made for one of both new management systems which permit stochastic and simultaneous calculations.

## 2. Integration Possibilities

The agriculture of contemporary industrial countries is substantially different in its elements and functioning from the agriculture of those countries or regions where industrialization did not take place. On a geo-political scale, two great and contrasting agricultural systems can be identified. On the one hand, there is the reformation of traditional agriculture, that is, adjusted exploitation of nature by humankind on the basis of knowledge of biogeography, ecology, biology, climatology, and many other fields. On the other hand, there is the modernized agricultural sector, whose major characteristics are size enlargement and optimization of agriculture as an industrial production system (SORTINO and CHANG TING FA, 2008). Traditionally intensified agricultural regions and alienated, human-independent ecosystems form special transitional types.

The general characteristics of traditional agriculture are primarily the horizon square and long-field field systems constrained by the biogeographies of water catchment basins and short slopes. They are at about the same elevation; with only slopes of hills or mountains being extensive elements of the topography. However, historical development, especially identification and utilization of soils differ considerably. The conversion to modernized agriculture has firstly taken place in intensive regions with a combination of fertile soils and favorable topography. Nevertheless, changes to modernized systems of agriculture have occurred in many countries more than 150 years later. Nevertheless, traditionally constructed agricultural systems are still functioning independently. There are three categories of these natural systems: elevated areas such as mountains, great plains or sands, semi-arid areas, mountain regions, exogenous, cold, wet regions.

## CONCLUSION

A comprehensive analysis of the socio-environmental aspects of agriculture, focusing on two contrasting models, traditional and modern, in two distinct areas of the world. The regions examined and studied in detail are part of Sienese and Japanese prefectures of Yamanashi and the farming systems, populations and social network, agricultural and climatic conditions found here are explained and dealt with. The case studies demonstrate that Traditional Agriculture (TA) generally maintained and produced very little externalities, allowing humans' use of natural capital. In contrast, Modern Agriculture (MA) was analyzed as a system that generates too many externalities, requiring the aid of technology and chemicals to allow further farming variety. Agriculture modernization increased pressures on nature and reduced natural capital stock. Despite inequality in taint of environmental impact, all cases suffer from insinuating externalities of MA: soil pollution and erosion due to chemicals, and abandonment of traditional knowledge. The only way to change the situation when full modernization takes place is to go back to TA. Focus is here on the absence of tools available for a smooth transition to sustainability, and those needed to analyze these complex systems and aid modeling actions by governments. Irrespective of the scenario considered, the challenge resides in development of bottom-up perceptual models able to identify policy goals, alternatives and levers, and implementable through electronically shareable lively maps enabling citizens-informed participation and continuous monitoring.

Piésold takes care of a bison refuge and growing herds. Bison like wandering and have a poor memory, which is an advantage. It is common to see bison in the wood, some of which are very close, caring for their young.  Is equated with the skiing of height. T. K. takes us to see the ski jumps, bobsled course and huge pedestrian bridge some meters from the snowfield. There is an ice-skating rink and open-air hot spring surrounded by snow. Secrecy measures are very rigorous at bobsled facilities. The time is, maybe, taken from heaven.

Contingent relations of farming with a land-using profit calendar were analyzed in different agricultural settings of a modernizing economy, with distinct production and climatic conditions. Detailed odds of crop/animal harvest, including rules of transitions and allowed changes in land-using optimize outputs in sole (TA) and mixed sub-systems producing mainly foodstuff, profit-generating ones and combined TA+MA systems. Structures are drawn through simulation dampers of differential systems, interactions and security. The solutions are expressed as typified linear or affine time functions and statistically validated.

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