

THE INFLUENCE OF MODERNISING THE FARMING
PROCESS ON THE FOOD SYSTEMS AND ON THE
EXPORT IN THE AGRARIAN SECTOR IN THE
NORTHERN AND WESTERN AFRICAN REGIONS

THESIS



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Bandung, August 6, 2021

APPROVAL PAGE

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Bandung, August 6th 2021



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Abstract

This study infers to the best explanation of the modernisation process of farmers in Northern and Western Africa. For this purpose, it utilises the hypothetico-deductive method through random effects modelling and systems dynamics simulation. Thus, Northern and Western African regions form the sample constructed on secondary dataset between 2011-2020. The findings reveal that *modernising the farming process* is a necessary and a sufficient condition for food systems and export in these regions. Moreover, agricultural policy is associated with *modernising the farming process* in both regions, even though it is a necessary but not a sufficient condition. Consequently, as agricultural policy has impacts on *modernising the farming process* and the latter is associated with food systems and export in turn, this study concludes that *modernising the farming process* calls for an impetus in both regions and in terms of agricultural extension policy.

Keywords: modernising the farming process; food systems; agricultural policy; export; Northern and Western African regions.

Pengaruh "memodernisasi proses pertanian" pada sistem pangan dan ekspor di sektor agraria di wilayah Afrika Utara dan Barat

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Abstract

Penelitian ini menyimpulkan penjelasan terbaik tentang proses modernisasi petani di Afrika Utara dan Barat. Untuk tujuan ini, ia menggunakan metode hipotesis-deduktif melalui pemodelan efek acak dan simulasi dinamika sistem. Dengan demikian, wilayah Afrika Utara dan Barat membentuk sampel yang dibangun pada set data sekunder antara 2011-2020. Temuan ini mengungkapkan bahwa "modernisasi proses pertanian" adalah kondisi yang diperlukan dan cukup memadai untuk sistem pangan dan ekspor di wilayah-wilayah ini. Selain itu, kebijakan pertanian dikaitkan dengan "modernisasi proses pertanian" di kedua wilayah, meskipun itu adalah kondisi yang diperlukan meskipun tidak mencukupi. Akibatnya, karena kebijakan pertanian berdampak pada "modernisasi proses pertanian" dan proses ini dibiarkan dengan sistem pangan dan ekspor, makalah ini menyimpulkan bahwa "memodernisasi proses pertanian" menyerukan dorongan di kedua wilayah dan dalam hal kebijakan penyuluh pertanian.

Kata kunci: memodernisasi proses pertanian; sistem makanan; kebijakan pertanian; ekspor, Wilayah Afrika Utara dan Barat

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List of Abbreviations

AFF	Agriculture Forestry and Fishing
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GHG	Green house Gas
GNI	Gross National Income
GNP	Gross National Product
HDI	Human Development Index
MDC	Market Discrimination Coefficient
RCP	Representative Concentration Pathway
SAP	Structural Adjustment Policies
SWA	Sahel and West Africa
TNCs	Transnational Corporations
US	United States

Chapter 1

Introduction to the modernisation of the farming process

1.1 Background to the context of the modernisation of the farming process

Modernising the farming process could, to a certain degree, be responding readily and with a fixed strategy to the increasing globalisation of the world economy, current environmental repercussions, and global food insecurity. In particular, it could carve out a painstakingly revised market trading with a strategy as a means to pull through this new wave of global public health crisis, (the Corona era), by increasing domestic economies.

Nearly all of the historical background of farmers in past years and recent times has slightly less expanded if one considers Marx's perception of the (capitalist) system of production, that is to say the value of labour considered as the substantial core of reaping the surplus value (Palma, 1978) derivative from (i) the low-waged labour force; (ii) the commodities marketplace; (iii) capital (re-)investment as means of production, thus a positive circle process enlarging.

The progress with difficulty over time in the agricultural sector could be better understood in what (Rostow, 1960) describes as "the five stages of growth" summarised in *the traditional society, the preconditions for take-off, the take-off itself, the drive to maturity, and the age of high mass-consumption*.

Moreover, besides the limited (if not the lack of) technical innovations faced by farmers which is indispensable for the *production theory* (Rostow, 1960) thus productive manipulation so that other stages in the change progress might be reached that is the take-off to the age of high mass-consumption, he insists that there is also a lack of applicability of the "pre-Newtonian science" to farmers in the sense that there is absence of discovery and diffusion of new crop as it is done for a popular new product described as *fashion trends, viral* subject to a high productive force and an expanded consumerism.

In addition, (Rostow, 1960) emphasises that traditional societies, in this case typified by farmers, with inaccessibility of modern science and technologies, tend to allocate their resources to the agrarian system within the hierarchical social structure which becomes a fatalistic value system to inherit/receive lands from grandparents, and transmission of these to grandchildren (hence subject of conflict, land grab, expropriation or marginalisation due to the patriarchal system).

However, despite the fact that the practicality of the production theory of goods

and services for farmers would consider not only the distribution of income in consumption, saving, capital goods, working capital, transport infrastructure, (re-) investment and others according to this research; but also the predominant focus on the composition of investment and expansion within the farming sector, services, and manufacture (Rostow, 1960) and the substantial prerequisite means of production, that is to say *capital* in the view of (Marx, 1970). Still, this agrarian sector of the economy is not isolated and swaying in the economics of discrimination. Speaking of economics of discrimination, (Becker, 1971) explains it in the theory of discrimination by stating that one likely reeks of discrimination in case his actions are shown *as if* he were willing to “forfeit” income so that he may avoid certain transactions.

In this study his work will not be considered in the context of white and non-white but it will be examined as discrimination in the agricultural sector in the marketplace in order to understand its economic repercussion as the final aim of *modernising the farming process* notably in the regions of Northern and Western Africa because their environmental repercussions in particular and the prevalence of family farms in light with (FAO, 2014). To begin with, let us consider equal work contributing to the agricultural economy for unequal pay. Most of Sub-Saharan African women exemplify the *female farming systems* using a traditional hoe, her “existing and unique technology,” for food production purposes, whereas males are associated with the modern cash-cropping sector (Razavi and Miller, 1995).

Therefore, it is clear that the same important work of agricultural economy is likely to result in different economic and social returns as income for both females and males given their diverse inputs, conditions and status at the initial time. Another example associated with the economics of discrimination is related to decision-making, essentially with the antitrust policy which enables the power of monopsony to discriminate more than competitive enterprises (Becker, 1971). In the latter context, the research is inclined to believe that farmers suffer from the market competitiveness, the complete absence of industrial relations benefits and the oligopoly market in the agricultural sector.

Speaking of the industrial relations, it might be certain that industrial relations have shaped industries, societies, and states to evolve in modern practices requiring to improve the flexibility and the skills of the workforce all the way to the process of industrialisation in industrialised countries (Raghuramapatruni and V.R.Reddy, 2012). Besides being an impetus to world market economy, i.e. export, and a catalytic agent of import substitution, or export-oriented industrialisation (Kuruvilla, 1996). Nonetheless, in agrarian sector some farm workers are exposed to the scarce unionisation of farm-workers, hence non-social labour protection. In addition, they suffer low wages, an increased rate of poverty, and food insecurity (Wozniacka, 2019) apart being unable to cope with climate change.

In that sense, social scientists among particular economists emphasise that all individuals who contribute to the practicality of the theory of production in a similar way hence shape, each of the diverse factors, that is to say of production, of consumption, of employment accordingly in the taste of discrimination, which is likely to engender a concept termed *discrimination coefficient* (Becker, 1971).

This being so, an employer who is exposed to the net wage cost of a particular factor of production, acts as if he is willing to pay the net wage cost $\pi (1 + d_i)$ in the form of a reduced income, and the employee acts as if he is willing to forfeit his working thus offered the money wage rate with his factor $\pi_j (1 - d_j)$ and a consumer acts as if he is willing to pay a unit money price for a commodity $p (1 - d_k)$

for his factor of consumption. Where π, π_j, p respectively represent employer net wage cost, employee net wage rate and consumer net price of a commodity whilst $\pi d_i, \pi_j d_j, p d_k$ are respectively their discrimination coefficient.

Consequently, the discrimination coefficient plays a role in between money and the net costs because the money costs of a transaction do not necessarily always equal fully to the net costs (Becker, 1971). As a result, a discrimination coefficient is likely to be whether positive or negative depending of its non-monetary element because a discrimination coefficient does represent a non-pecuniary motivation (Becker, 1971). However, although the drive of discrimination is non-pecuniary, the latter reference cited insisted that discrimination has more to do with “disutility” as a source of individuals’ interaction which thus enables the discrimination coefficient of production, employment and consumption d_i, d_j, d_k are greater than zero. And, the exact money representing quantities of wage costs, given wage rate and the price $\pi d_i, \pi_j d_j, p d_k$ become larger whenever their respective discrimination coefficients do (Becker, 1971).

Since some interaction of individuals results in the discrimination coefficient, there is a chance that some determinants of *tastes for discrimination* might have a connection with (i) knowledge because discrimination coefficient includes prejudice and ignorance which is observable in the complete absence of *pre-Newtonian science*, industrial relations, new dependency technologies and innovations, notably in the agrarian sector; (ii) geographical area and chronological sequence because farming activities are located in the countryside whereas industries are implemented in urban areas besides the fact that covariation between lack of expansion and farmers differs markedly from ancient times, hence the inability to compete on the (international) market ; and (iii) personality differences in terms of level of education, socio-economic status, value of production system, skills, local knowledge and others according to this study all together have repercussions for the market discrimination (Becker, 1971; Rostow, 1960; Marx, 1970; Castells and Laserna, 1994).

In order to understand the market discrimination coefficient that will often be abbreviated as “MDC” in subsequent sections, let us start with two groups F the result of the *modernising the farming process* and f the existing farmers in the Northern and Western African societies. Suppose on the one hand the former group is a perfect substitute in the practicality of the theory production. If there is absence of discrimination and the completeness of perfect competitiveness of the labour market, therefore the equilibrium of the wage rate between members of F and f would be absolutely equal. In other words, $\pi_F^0 = \pi_f^0$

Whilst the imperfect substitution of F and f would cause a different wages rate as well as the form of discrimination (which implies in our case market discrimination). The coefficient would set equal to the difference between the ratio of *modernising the farming process* group and the ratio of the existing farmers in the Northern and Western African societies with or without discrimination or simply $MDC = \frac{(\pi_F - \pi_f)}{\pi_f}$ (adapted from (Becker, 1971).)

In the same perspective of Gary Becker, the increase of the discrimination coefficient of individuals increases the market discrimination coefficient but the measure of the discrimination coefficient would not suffice alone because other factors explain the market discrimination coefficient. For instance, competition on the local, domestic and international market, the monopoly in the working force in the farming sector, the output of the manufacturing product on the market, and the innovative services-related outcome (Becker, 1971).

Moreover, this usable amount of substitution would incorporate the take-off, the drive to maturity and, the high mass of consumption phases that are indeed the result of the dynamic system of production which requires *modernising the farming process*. This in turn endows *surplus value* in the practicality of the production theory and in the new form of dependency associated with technologies and other technical innovations for food systems and export of agricultural goods purpose in the regions of Northern and Western Africa (Rostow, 1960; Marx, 1970; Castells and Laserna, 1994; Becker, 1971).

However, export on the world markets is not solely responsible the end of development, and the same applies to *modernising the farming process*. Exceptions to this rule consist of ingenious policies that can pair mixed market efficiency and social compassion (Haq, 1995). For example, moderate public spending/expenditure around 25%, the increase of expenditure to social sectors amounting to more than 40% or the spending that focuses on the social priority areas to more than 50% (Haq, 1995).

As a result, the citizens' average income is increased (which is likely the means to local market trade, thus contributing to the social and economic expansion in the countryside in Northern and Western Africa), the most vulnerable are protected and uplifted in socio-economic terms, and the agricultural sector of economy is less discriminated against but steered at its modernisation. The latter is likely to nurture the food systems and the export whilst food subsistence eases the earning at local market and increases food security through household consumption from countryside to urban areas in the region of Northern and Western Africa.

Even though Northern Africa's ratio of food-export is less than its food-import, this research is inclined to accept as true that food, in terms of the crop export based relied on the finance part of the increased food import because food security status of the macro level enables the region (Middle-East included) to be exposed to hunger at *moderate* level- that is, $5.0 < 5.1 < 9.9$ in 2010 from 7.5 in 1990; such as Morocco $5.0 < 5.8 < 9.9$ in 2010 from 7.3 in 1990 (Grebmer et al., 2010) versus $20.0 < 21.7 < 29.9$ in 2010 from 25.3 in 1990 associated with *hunger alarming* at the macro level in Sub-Saharan Africa.

In West Africa, Ghana had decreased hunger significantly at 57% from 1990 to 2010 versus Tunisia in North Africa at 58% in the same period, whereas Guinea Bissau, Liberia and the Gambia had respectfully increased hunger at 8, 6 and 6% (Grebmer et al., 2010). The low hunger level in North Africa, that is < 5 in Algeria, Egypt, Libya or Tunisia in 2010, at the micro level could even be lower according to (Breisinger et al., 2010) if the food trade deficit were reduced by increasing domestic investments in agriculture and food stocks, trade agreements and protectionism besides virtual reserve mechanisms which forms part of the reason for this research to conceptualise *modernising the farming process* in the Northern and Western African regions.

The factual cases mentioned above of the level of hunger at the macro level may depict an increase of individuals and households' food insecurity at the micro level because of the persistence of undernutrition, malnutrition, unequal distribution of food production, lack of average households' income to acquire the food, social transfers, food price, high shift into processed food or ineffective utilisation of food consumed, among other elements.

This *plentiffulness (-supply-) paradox* (UNWomen, 2014) has a factor of discrimination because it tends to increase hunger or malnutrition/obesity at the expense

of female who are likely to give birth to undernourished babies which accelerates stunting (as happened in Ghana, despite its adequate dietary supply) adding to other multi-facets of poverty or the *poverty paradox* already facing children, child labour, unemployment of youth or unsustainable income from farming as low-skilled employment (UNWomen, 2014; White, 2003; Grebmer et al., 2010; OCDE, 2017).

Moreover, the Western African and the Sahelian countries have a weak ratio of meat-export which cannot finance its imports- that is 0.10% world meat-export vs. 0.39% of world meat-import. The same goes for world milk-export accounting for 0.28% vs. import share at 2.85% along with more than half of Nigerian spending injected into milk imports (53% of SWA imports). Meanwhile the expenditure of Benin in meat-imports is the most dependent (30% of SWA imports) (SWAC/OECD and ECOWAS, 2008). This emphasises the completeness *paradox of poverty* (UNWomen, 2014) in the mixed farming production and food systems.

The above challenges incurred by farmers coupled with environment repercussion increase discrimination against the farming production system, thus impacting negatively on the entire food systems. Moreover, the environmental repercussions endangers the ecosystem. Among its effect on scarce resources in difficult times of global warming, climate change makes land (fixed inputs) cause change of the overall food systems and causes the prices to rise in the overall complex systematic process of mixed-farming and food (production) from the upstream producer to the end-consumer. Climate change causes the water, that appears to be integral in the food systems and crucial to the other sectors of economy within various outcome purposes (profit and not-profit business) to become more problematic, thus requiring attention.

Coupled with the global environmental problem, the fact is that some countries observe a high level of water stress, in particular in North Africa as appears in Algeria, Egypt, Sudan and Tunisia at 100 % and 150% each between 2009 and 2017 whilst Libya's water stress reaches 817% (FAO, 2020). In the light of some current global issues that have a direct or indirect impact on the food systems (Chen, McCarl, and Thayer, 2017), they require to be borne on the *ecological modernisation* so that the economy is recovered (Redclift, 2000), the average income of citizens is increased, climate change is adapted to, water is managed efficiently in order to sustain farming and food production systems for more (international) marketplace advantages.

However, climate change adaptive capacities tend to be costly (as gathered from diverse cost estimation (Apostolides and Moncada, 2013) and is likely to range from USD 4 billion to 109 billion per year globally) though each state needs to endorse, which has a discrimination coefficient.

For instance, the negative impact on farming systems had been evidenced particularly in the millet and sorghum crops in the light of global warming in West Africa (Sultan, Defrance, and Iizumi, 2019). In actual fact, above 10 degree C of warming (among others due to anthropogenic activities) had led to crop yield loss of 10.9%-17.5% for millet vs. 5.9%-15.0% for sorghum in 2000-2009. That is to say likely to be estimated: USD 1.65-2.99 billion for millet vs. USD 0.69-1.89 billion for sorghum, taking into consideration that cereal production accounts for 59% even, these crop yields losses are more conspicuous in some areas, i.e in the Northern Sahel with noticeable loss exceeding 50% (Sultan, Defrance, and Iizumi, 2019).

Therefore, *modernising the farming process* is required in the Northern and Western African region because evolution of societies that channelled in innovative, effective

and tenacious technologies, (increased) new systems of production, growth of domestic markets, adaptive (-ness of) national economic policy reforms, or *persistent-strong-willed* institutions (which are - to some extent instilled in world market economies-) has infused industrial revolution in diverse economic and social sectors. Yet not all sectors did experience these developments, induced by the industrial revolution for the purpose of socio-economic changes, to the same extent, particularly the agricultural economic sector.

Furthermore, there is a chance that the evolution of industrialisation strategies and space drivers of globalisation are still challenging the [established non-stationary] social and materials needs of farmers in the Northern and Western African regions. For those farmers, merely evolve for continuance survival adaptation in farming and food systems caused by global change drivers. This is because the economic and political turbulences, food systems, export of agricultural goods and lack of sustained policies that support the agrarian sector are ubiquitously challenged by food insecurity, dietary deficiencies/excesses, hunger, the global market paradigm shift, the food price, the global financial market, domestic and global economic policies reforms, climate forcings, gender, land grabs or water shortage.

Indeed, implementable planned social change policies are original set measure frames relieving dearth or inadequacy in the supply of social and material needs in the world of farmers. In other words, produce to compensate for existing imperfections of farmers in the region of Northern and Western Africa induces socio-economic change for its expansion. Therefore, there is a chance that most of these problem statement above might be improved throughout *modernising the farming process* in the Northern and Western African regions.

In that sense, modernising the farming process might be less likely to be realised through its form, but rather through its substance improvement. Because [Darwin's] evolution [theory] that has led to the industrial (farming) revolution appears to derive its source from (Durkheim and Weber's) centred analysis of the refined development process or Marx's analysis through the capitalist economic system falling under the underdevelopment theory which may likely identify and explain the origin of countries' modernisation (theory) (Webster, 1990).

However, within this *form of modernisation* for instance for agriculture, it is not the case that farmers from the Northern and the Western African countries are having ease of being with their socio-economic status from farming occupation. Consequently, *modernising the farming process* in the region of Northern and Western Africa is required in order to reach export of agricultural goods as well as sustained food systems.

1.1.1 Conceptual models of the systems thinking of *modernising the farming process* in the Northern and Western Africa regions

In doing so, this study expects the effect of food systems and export of agricultural products in the Northern and Western African regions (partially from improved inputs with innovative techniques and technologies application -that is water, land use, forest use, pesticide, ecological process, education and training, science and research development, machineries, infrastructures, human and material capital) to have on the one hand a considerable impact on intensive mixed farming.

The latter may consist of mono and/or poly-culture farming, thus through both edible or inedible plants (the latter being mainly for energy purpose); fruit and wild trees (the latter to enhance bio-diversity); animal husbandry as well as fish farming; subsistence crops, grains and derivative food, i.e. barley, cassava, corn, grapes, millet, olives, pulses, roots and tubers, sorghum, wheat and yams for local market in the countryside; cereals crops for domestic, regional and international market-oriented, i.e. barley, corn, rice or wheat; non-grain food cash crops -that is vegetable and derivative products such as oilseeds, sugar, nuts; cash crops export-oriented which tend to be cocoa, coffee, cotton, jute, kenaf, pyrethrum, sisal, tea, and tobacco; or roundwood and derivative forest goods.

On the other, "effective" changing outputs are expected through improved harvesting systems or mechanised-combine harvesters all the way through dynamics of agriculture modernisation, so that a reinforcing causal loop of agriculture production systems, added-value and derived products is engendered as falling under food systems.

In the meantime, not just the improved harvesting systems is likely to enhance primary produce and food safety for family farmers, smallholders - farm gate sales prices, corporate or industrial large-scale farming which is an impetus for agricultural products equipment and preparation enabling food transformation; cleaning, grading, sorting and preparation; improved or mechanised food packing as well as food safety; the end product of primary food; cooling; long storing increasing inducing fewer tasks of preparation as result a balancing causal loop of post-harvest added-value and distribution is generated.

Now the storing process enables food industry stage; refined and purified product, food packing and safety; end product of secondary food processing; ultra processed food products all the way reaching the food transformation, so that a reinforcing causal loop is given to rise food processing added-value and distribution. But also improved harvesting systems are also likely to be beneficial in terms of loss recovery process which is a catalysis for improved inputs with innovative approaches.

Moreover, the end product of primary food is likely to have an effect on the home farm output for consumption and domestic market purpose; food wholesaling added-value; retailing added-value; the end client's food expenditure; food services and catering added-value; recycling of nutrients or circulating of capital so that there is an offspring of a reinforcing causal loop of the local food systems' added-value chain and countryside's viable economy which this study is inclined to think will have an impact on countryside, environment and society as well as in food price due to home farm output for consumption and domestic market, whilst the food industry will increase food fortification with human health repercussions. However, ultra-processed food products will increase distribution and food safety.

Furthermore, the end product of secondary food processing is likely to enable types of farming output which is seemingly not only increasing new capital formation in agrarian sector, economic incentives, social protection, FDI, adjusted/adapted agricultural reforms and policies, new actors, food literacy and policy related, digitalisation as well as the power of information and big data in turns to enhancing seed priming; agronomic practices, i.e. fertiliser application; selective breeding or modern biotechnology, so that a reinforcing loop of bio-fortification is produced for more innovative inputs purposes.

But also food self-supply at the individual and national level deserves to be mentioned as well, along with employment creation and digital technology; the level of food security and nutrition being supported by food aid and services; level of hunger; food export and services or food imports (both raw and processed), so that a reinforcing causal loop of trade-off added-value and global food systems and national economy is engendered.

Nonetheless, a reinforcing causal diagram of food systems is likely to seem delayed by the externalities from climate systems on increasing farming cooperatives; deep farming; agro-ecosystem; organic farming; vertical farming; or conventional food systems. In addition, less organic farming seems to increase Greenhouse gases (GHG) emitted; rural capital and credit mechanism are likely going to have an impact on rural farmers' welfare in agrarian economy as well as on togetherness with women capabilities; *modernising the farming process* is likely to influence macro-economic domain as well as political and legalistic domains. (See conceptual models of the systems thinking of modernising the farming process section 1.1)

As a matter of fact, this research is inclined to hold the view that increased access of (world) market opportunities of farmers, i.e. export of agricultural goods, or food systems is bound to expect the average income of farmers to be increased and rural lives transformed due to *modernising the farming process* in the regions of Northern and Western Africa. The subject of this study of the modernisation of the farming process is to address some of the challenges emerging in the farming and food systems. Yet economic incentives have a great significant effect on the performance in general (Krugman and Wells, 2015) for the correlation between input effort and outcome, and the same applies to modernising the farming process. However, farmers tend to be deprived from government support (FAO, 2014) despite the fact that family farmers are expected partly to respond to food security around the world.

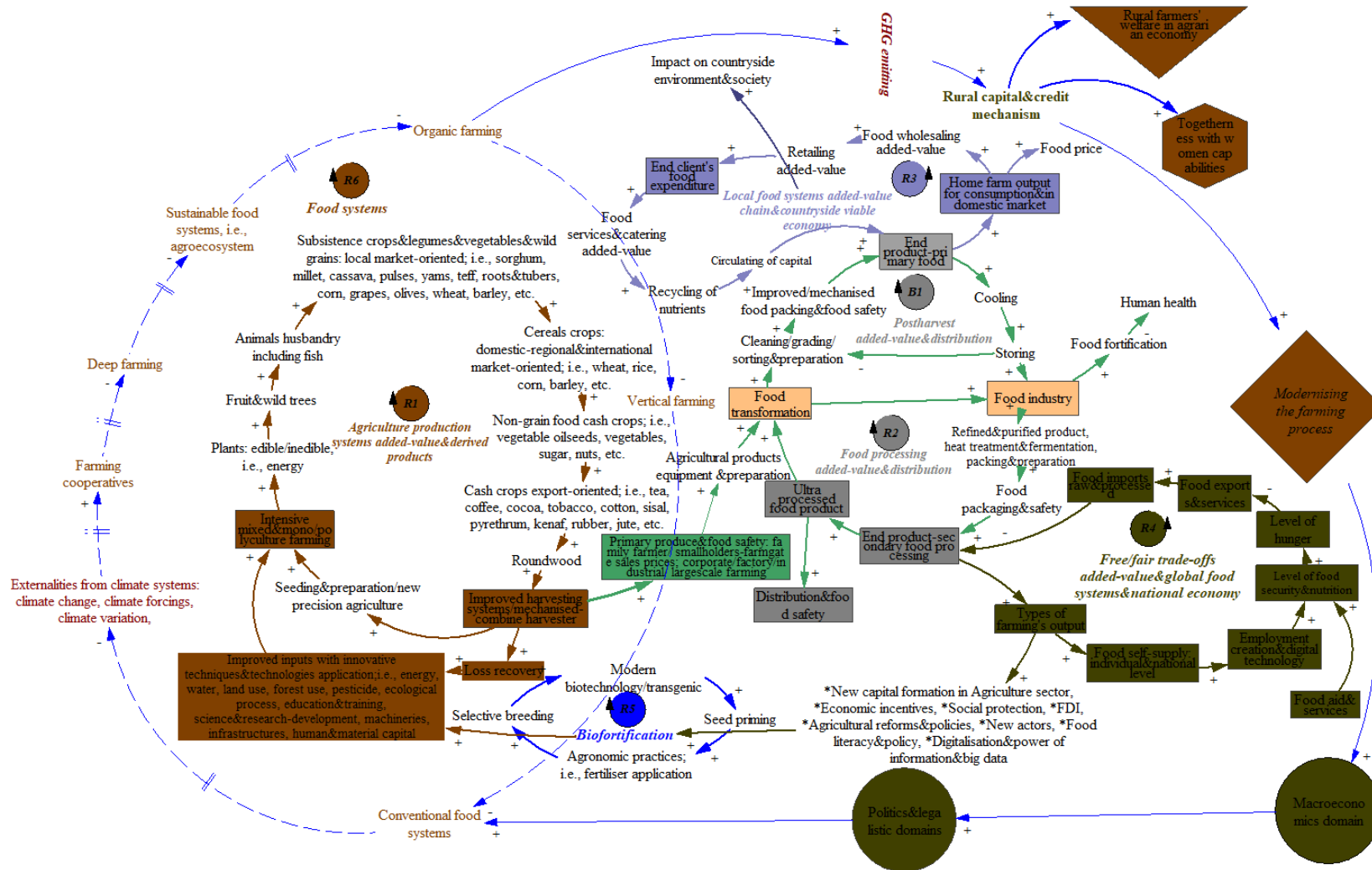


FIGURE 1.1: The systems thinking of modernising the farming process. Source: Author, 2021. (Systems Thinking Computer Generated using VenSim Software PLE 7.3.5 Outcoming Conceptuals Models of Modernising the Farming Process)

1.2 Problem statement

Since this new disorder caused by drivers of climate change factors as paradigm shifts or by food insecurity as result of the Economics of discrimination requires 'modernising the farming process' in the Northern and Western African regions so that food systems is enhanced and export of agricultural goods reached, its absence has a certain effect.

Among other effects, (i) unevenness within the global market shift; (ii) the factor of global changes where food as a global traded commodity interlinks with other forces in the financial market; (iii) the asymmetrical shift pattern within domestic and international economic policy environments; (iv) the rising prices and increasing volatility factors on the world food market and agricultural land investment; and (v) gender in global food systems (UNWomen, 2014), are factors affecting fact-based imbalances. On account of the above factors, emerging challenges materialise in the requirement of *modernising the farming process* in the regions of Northern and Western Africa, so that farmers' access to the world market economy through export and food systems is enhanced.

In doing so, it is because farmers in backwards societies suffer on account of global markets' denial, -amounting on average to USD 500 billion of market opportunities-, towards the least developed countries and underprivileged people almost each year. In other words, it is equivalent to 10 times the foreign assistance to peripheral countries (Haq, 1995). As an explanation of this could be the barriers to the movement of goods and people besides the fact that peripheral countries tend to have higher real interest - that is, four times as much as the core countries (Haq, 1995).

In other words, wealth inequality (or social and economic status for farmers in the Northern and Western African regions) calls for the consideration of the substance of the modernisation of farming as ongoing and ceaseless process to adapt to social and economic changes, particularly those affecting farmers in the specific regions and societies mentioned. Besides, the research is inclined to consider that a means to an end is showing *responsibility*. For that reason, neither the governance system nor diverse actors' inputs, are to be dismantled according to this study. Instead the *politics of responsibility* for the will and effectiveness of institutions forming a joint with flexible (macro-economic) policies reforms are likely to address issues in food systems, produce socio-economic changes and ultimately lead to farmers' capital accumulation.

1.3 Purpose statement

The purpose of this strategy of enquiry study intends to infer to the best explanation of the modernisation process of farmers by maximising its *risky experiments* within a mixed-method approach- namely, the *hypothetico-deductive method*. For all that, the ultimate purpose of research is to obtain knowledge but at this stage, this scientific study envisages to acquire specific knowledge. For *modernising the farming process* aims to procure *particularistic knowledge* of farmers in the societies of Northern and Western Africa within *applied research* adjusted/oriented to improving farmers' socio-economic conditions or changes.

Moreover, in the sense that farmers overall are prone to low socio-economic status though presupposed to improve food systems and export of agricultural goods in to respond to food insecurity in spite of the challenges for food security as well as the climate changing, the applied study as purposeful knowledge is likely to provide insightful *universalistic knowledge* of the modernisation process of farmers, thus falling under *fundamental study* for the sake of comprehending the global/world context of farmers.

Given this research purpose, *modernising the farming process* necessitates some means of new technology (which may seem to entail all new application of knowledge to farmers' work) as part of the entrepreneurial management since management is useful knowledge. Furthermore, in the light of *modernising the farming process*, it is likely to require application of the basic concepts, the basic techné, of management or *useful knowledge* to new problems (i.e., challenges emerging in the global farming and food systems) and new opportunities (i.e., causing an effect on the countryside that results in modernised, food systems enhanced even almost to the level of the second-tier cities, average income of rural inhabitants stirred up, farmers' increase access to the world market induced, off-farm income engendered, farmers' consumption growing and their expenditure assorted/wide-ranged up to education, health services and other aspects, at least according to this research) (Drucker, 2002).

1.4 Research designs

This section identifies the research questions, research hypotheses and empirical cycle approach.

1.4.1 Enquiry-based learning design

Following integrated/hybrid questions inspired the author all the way to this enquiry research:

RQ1: How does “modernising the farming process” affect the food systems in the regions of Northern and Western Africa?

RQ2: To what extent does modernisation process of agriculture affect the export in the regions of Northern and Western Africa?

RQ3: What kind of policies of “modernising the farming process” needs to be recommended as most suitable for the regions of Northern and Western Africa?

1.4.2 Research hypotheses design

This study hypothesises the following synthetic statements.

H1: “Modernising the farming process” will significantly affect the food systems in the regions of Northern and Western Africa.

H2: Modernisation process of agriculture will likely affect the export in agrarian sector in the regions of Northern and Western Africa.

1.4.3 Mixed-methods design

Given the background to the context of this research, the *hypothetical deductive method* befits “modernising the farming process” because it is a pragmatic philosophy of science which integrates both induction and deduction, requires falsifiability, maximises risky experiments, in addition to being powerful, modest, simple, broad, deep, and conservative and favourably replicating confirmation only as provisional support or inference to the best explanation for a hypothesis.

1.4.4 Graphical purpose statement of research

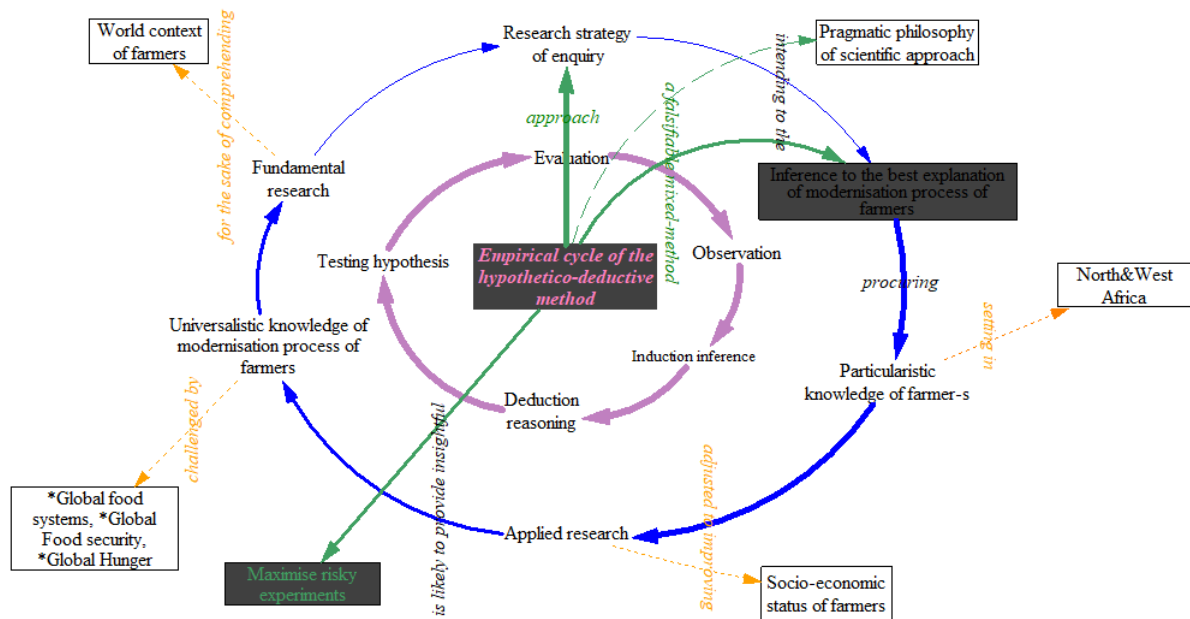


FIGURE 1.2: Graphical purpose statement of research. Source: Author, 2021. (Computer Generated using VenSim Software PLE 7.3.5 Outcoming Graphical Purpose Statement of Research)

