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**Farm Management in the Context of Deathly Embrace between Agriculture and Industry: A Theoretic model Analysis of Two-Sector Developing Economy.**

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**Preliminary Abstract**

The case has been made for the need to develop a theory of policy intervention applicable to the peculiar circumstances of a developing economy. Towards this end a model has been developed that ascribes definite character to the agriculture-industry interrelationship in terms of the two sectors being engaged in theoretic 'embrace' that leads to the lack of economic progress. The Nigerian case provides the qualitative empirical base for substantiating the main proposition and postulating the several hypotheses.

It is established that the critical elements of the farm enterprise are affected by the character of agriculture-industry interrelationship as it were, while the framework of analysis gives indications of new demand on the management capacity of farm-firms in particular. And, given the preponderance of small farms together with the strong family character and resource - poverty situation, the need for policy instruments at micro, meso and macro levels for upgrading farm management capabilities in developing economies becomes much clearer from the analysis. The role of farm management extension is most crucial among the possible modes of policy intervention for this purpose.

## Introduction

The knowledge about structural character of developing economy is generally taken for granted while experts explore appropriate intervention modes for achieving sustained growth. Yet, a long time ago, it has been recognized that the structure of industrial economies of the "North" which this assumption and concomitant theories rest upon depart radically from the structure of developing economies of the "South" (Shultz 1953, Nicholls 1969). Ruttan 1969). That this assumption does not hold is reflected in the several years of 'Breton Woods' institutions approach based on conventional theories without significant break-throughs' in the performance of the several developing economies of the world. Thus, a new line of thought emerge in the direction of characterizing the structure of developing economies with a view to determining effective intervention policies.

This paper investigates the character of developing economy within a definite theoretical framework. The goal is to specify the main elements of the structure and describe its forms and function. The objective pertains to determining the role of policy instruments for enhancing competitiveness of the agricultural economy. In this context, the ways in which the model structure affects the farm-firm behaviour represent an important basis to evaluate such policies.

Several developing countries of the world in which structural adjustment programmes have been sponsored by the international agencies in trade and finance have an avenue in the outcomes of this analysis to determine the structural factors making the intervention ineffectual. Therefore, both the countries concerned and sponsoring bodies would draw

considerable benefits from the analysis based on warranted measures for enhancing the performance of the agricultural economy and improved knowledge about the link between management of farm enterprises at the micro level and policy intervention at the macro level.

### Conceptual framework

The primary point of departure from traditional duality postulate i.e that the national economy may be divided into two aggregates, agriculture and industry (Thorbecke and Field 1969, Haessel 1970), is the focus on the need to ascribe a definite character to developing economy structure.

It is conceived that the evidenced role failure in respect of the two sectors in their interrelationship in the structure is responsible for the perpetual ineffectiveness of intervention policies. This structure may be construed in terms of the two organs depending on each other for thrusts (inputs) and feed-backs (outputs); when both organs wait for each other to perform these reciprocal roles the system tends to slow down or stagnates almost completely. This situation of the developing economy structure is akin to system embrace. A 'deathly' embrace situation describes the seeming complete stagnation of the system as observed in many developing economies. In the "simple embrace" case on one hand, the industry and agriculture sectors of the national economy are considered as holistic units, so their joint fortune can be looked into by exploring the relationship between them in terms of structure and transmission mechanism.

In consonance with the conclusion drawn by Haessel (1970), this approach follows the general direction of "formulation and implementation of development policies which exploit the interrelationship between industry and agriculture in a manner which promotes the mutual development". On the other hand, we might speak of "multiple embrace" to show

that it is not only ill-health in agriculture that hods down industry and vice versa but that ill-health in the transportation sector, social services, education sector and others lead to more severe illness of the agricultural sector".

Within this theoretic embrace context, the following hypothesis emerge about the market competitiveness which provides the conducive environment for efficient farm management:

**Structure:**

The link system has a structural dimension which governs the market for products and inputs with respect to concentration and differentiation. Thus, a malstructured relationship of agriculture with industry represents critical sources of embrace. The variable of policy decisions to "deembrace" such a system will include appropriate fiscal, monetary and trade instruments for eliminating lopsided concentration of enterprises on both sides of the link as well as reducing the degree of possible product differentiation therein. The following hypothetical propositions follow directly from the structural context for a developing economy:

1. Structural problem exists through numerical imbalance of agricultural production units with those of industry which creates disproportionate volumes of goods and services across sectors: in the extent that the free flow of commodities is impaired concomitant to the numerical imbalance, in that extent the organs of the A-I system embrace each other.
2. Structural failure results from misalignment of the component parts so certain production units are far larger or smaller than proportionately required relative to other units of the same or other sector in the system; to the extent that this creates the avenue for considerable wastes in resource use and missing of the targets that

specific production units should impact upon, to that extent that agriculture and industry embrace each other.

3. Structural failure emanates from missing components which reduce the capacity of the system to produce and consume; the extent that the resultant capacity underutilization handicaps dependent production units within and between the sectors is the extent that an embrace of the sectors occur in the system.

Conduct:

The conduct of the A-I system pertains to the presence of certain factors in the production and consumption processes in both sectors that inhibit the smooth working of the joint market system. The main factor is the limitation of freedom of entry or exit into the individual and joint markets. The following hypotheses apply:

1. Poor conduct of the A-I system exists in terms of the presence of active or passive barriers to enterprise and trade in developing economy; to the extent that implicit and explicit restrictions to entrepreneurship and commerce inhibit market competitiveness in agriculture and industry, to that extent that several points of friction exist to lead to system embrace.
2. Poor conduct of the A-I system results from the absence of government system that permits democratic economy and allows the maximum participation of production and consumption units in the policy decision processes; the extent that enterprise initiatives in these units are stifled in the circumstance is the same extent that the two

sectors are incapacitated to perform the roles expected of them leading to system embrace.

3. Poor conduct of the A-I system is a consequence of the widespread state domination of enterprise system; the extent of resource wastage, and leakages emanating from direct and indirect domination of private enterprise system is the same extent that both sectors are inefficient in the production, distribution and consumption of foods and services, hence their poor role performance and consequent embrace.

#### **Performance:**

The key variable to judge overall performance of the A-I interactive system is income; it is a strong quality of life variable also, thereby making it useful in the context of integrated rural development as well. Therefore income levels in agriculture and industry represent the principal vehicle for establishing internal and external harmony of the system. The American experience shows that policy actions to align and realign income level in agriculture with level in industry is an effective mode of intervention to upgrade overall system performance.

However, the following propositions emanate from the developing economy setting.

1. Poor performance of the system manifests in terms of the historically inferior income status of the agricultural sector compared with industrial sector; in the extent that the income levels for both sectors fail to match effort-for-effort, in that extent the second-generation problems relating to migration, structural employment and similar others will obstruct the connectivity of both organs causing them to embrace.

2. Poor performance of the  $\Lambda$ -I system reflects the weak distributional impact of national income relative to sectoral contributions and capabilities; to the large extent that income from a leading sector is not sufficiently channelled for enhancing the productivity of the other sector at any point in time, to that large extent that one sector lags behind to pull (or at least slow) down the progress of the other sector at that point in time depicting an embrace of sectors.

### Model

Let the structural model of the agricultural-industry ( $\Lambda$ -I) system be construed in terms of joint input use by both sectors in a single competitive national market framework; given a two-input resource base of the dual economy, land (T) and labour (L):

1.  $X[T_x, L_x] \Rightarrow$  Production function for agriculture sector (X);
2.  $Y[T_y, L_y] \Rightarrow$  Production function for industry sector (Y);
3.  $T_x + T_y \leq T \Rightarrow$  total stock of land available;
4.  $L_x + L_y \leq L \Rightarrow$  total stock of labour available.

In this framework the production possibility frontier exists to specify in theory the maximum employment of land and labour by both sectors of the economy. Then the empirical task is that of locating the locus of joint input use in the domain bound by the frontier and the axes. As a first utility of the model analysis, the relativity of any point of resource use against the frontier can be explained in the context of sector embrace, following which candidate policy prescriptions will emerge and can be evaluated within the same context.

By extension we can demonstrate the critical links between the sectors in terms of output of one serving as input of the other in addition to both drawing from a common pool



of national resources and the fact that each sector also utilizes part of its own output in the production process. In this case we have:

$$5. \quad X[T_x, L_x; Q_y^x, Q_x^x] \Rightarrow \text{production function for agriculture sector}$$

$$6. \quad Y[T_y, L_y; Q_y^y, Q_x^y] \Rightarrow \text{production function for industry sector.}$$

That is sector outputs behave as intermediate inputs in the A-I system; so net output (N) is defined for each sector:

$$7. \quad N_x = [X - Q_x^x - Q_x^y] \Rightarrow \text{net output identity for agriculture sector}$$

$$8. \quad N_y = [Y - Q_y^y - Q_y^x] \Rightarrow \text{net output identity for industry sector}$$

In the final analysis, output of one sector is an argument in the net output of the other sector and vice versa. Since net output is what is actually available for consumption and trade, the fortunes of agriculture and industry are intricately joint in the A-I system as formulated. Subsequently, this joinage helps in the determination of the "static embrace" status of the system directly therefrom through the derivation and estimation of a suitable quantity or measurement index depending on actual specifications.

The computation of the dynamic embrace status requires the introduction of time into the analysis as follows:

$$9. \quad T_x(t) + T_y(t) \leq T(t)$$

$$10. \quad L_x(t) + L_y(t) \leq L(t)$$

$$11. \quad X_t = F[T_x(t), L_x(t); Q_y^x(t-1); Q_x^x(t-1); \alpha(t), R(t)]$$

$$12. \quad Y_t = G[T_y(t); L_y(t); Q_y^y(t-1); Q_x^y(t-1); \beta(t), R(t)]$$

By implication  $\alpha$  and  $\beta$  represent technological progress in agriculture and industry respectively, both to capture the endogenous growth in the Haris-Todaro (1970) and Romer (1992) senses which depends on total investment in agriculture and industrial output;  $R(t)$  is government or policy factor.

This structure of the model establishes a definite interactive character for the agriculture-industry relationship, but which lacks the inclusion of the conventional macroeconomic and policy variables yet. We need to fill in this gap to give both theoretical and practical effect to the role of government in manipulating the monetary and fiscal environments to shape the collective fortune of the two sectors. One way to achieve this is by making such variables arguments in the level of land, labour and quantities. Then we have corresponding variants of the functions (5) and (6) and equations (7) and (8) above as follows with  $\Phi$  as a vector of relevant policy variables such as interest rate, foreign exchange rate, government spending, among others.

$$13. \quad X \left[ T_x(\phi), L_x(\phi); Q_y^x(\phi), O_x^x(\phi) \right] \Rightarrow \text{production function for agriculture sector}$$

$$14. \quad X \left[ T_y(\phi), L_y(\phi); Q_y^y(\phi), Q_x^y(\phi) \right] \Rightarrow \text{production function for industry sector}$$

$$15. \quad N_x = \left[ X(\phi) - Q_x^x(\phi) - Q_x^y(\phi) \right] \Rightarrow \text{net output identity for agriculture sector}$$

$$16. \quad N_y = \left[ Y(\phi) - Q_y^y(\phi) - Q_y^x(\phi) \right] \Rightarrow \text{net output identity for industry sector}$$

The important issue however is how decisions are to be made to achieve profit maximization and efficiency in the production units so that the scope of policy intervention can be determined. The mechanism for doing so involves deembracing the structure, conduct and performance of the A-I system. It is envisaged that mode will make policy intervention

to be more focused, more targeted and most effective.

The scope of policy intervention depends on the ability to incorporate the relevant instruments into the model structure while the effectiveness of any intervention depends on the elements of the economic structure that govern decisions toward profit maximization and production efficiency. As regards, the latter aspect, the proper management of farm and non-farm agricultural enterprises represent an important factor of intervention effectiveness. This critical role of farm management is concealed inside the last two mathematical expressions of the model itself.

Equations 15 states that net agricultural output of developing economy is identical to the total agriculture output less the quantities used for further production in agriculture and industry. The role perception for farm management in the process is based on the grounds of input utilization efficiency and profit maximization. First, the volume of total agricultural output,  $X(\theta)$ , sets the overall ceiling of net production. Effective use of modern technology on farms such as machines and improved seeds or breeding stock can shift the production possibilities frontier upwards.

Given the large scope for this to happen in developing economy the model helps to make policy choices for technology improvements at the farm level.

Second, proper farm management makes possible the efficiency of utilization of agricultural output that is ploughed back as inputs for further agricultural production

{i.e.  $Q_x^x = \theta$ }. The traditional method of production analysis will apply wherein the optimal

combination of these inputs are determined by equality between rates of technical substitution and price ratios.

Lastly the relevant argument in equation 16 is  $Q_x^x = \theta$  which denotes the volume of industrial output used as input in agriculture. This component complements  $Q_x^x = \theta$  to generate the subsequent round of agricultural output thereby giving importance to the ability of farm management to combine different inputs more efficiently in the production process.

### **Empirical Substantiation with Nigeria**

#### **Background to the Agricultural Economy:**

The original thoughts of an economy in theoretic embrace have been practically informed by the behaviour and performance of Nigeria as a developing country. In that economy over 100 million people (1991 Census) dwell over a land mass of about 924000 square kilometres or some 355000 square miles, representing a huge human and physical resource base. Nevertheless, the country is largely a rural economy with about 70% of the people engaged in direct or indirect production activities in agriculture. The production possibilities involve five agro ecological zones and massive water bodies particularly an extensive coast line as well as the two long Rivers (Niger, Benue) that trisect the country geographically.

The southern part is generally a tree crop economy (cocoa, coffee, kola, timber and other forest products); the middle belt is essentially a food crop economy (foodgrains and tubers especially); while the extreme north is better known for the large livestock population (cattle, sheep, goats and poultry). The country used to pride itself in mountainous "groundnut pyramids" and cocoa domes in the export trade during 1960s. In the hay-days of agriculture of the country these commodities, as well as palm produce and other items, represented the leading sources of foreign exchange until the advent of petroleum boom in the early 1970s

However, over the years, the oil money has created immense urban boom which has attracted the youth into towns in large numbers, leading to significant increases in the production of aged farmers, given that the population of farmers has not decreased. As a result the agricultural growth slumped both in terms of its share of the primary export market and domestic availability of food or other agricultural products.

#### **Intervention policies:**

The attainment of independence in 1960 terminated the "surplus extraction" philosophy of public agricultural policies under the British colonial rule. The initial approach to agricultural development emphasized the inherited matrix of market intervention boards. The first post-independence decade (1960-1970) featured a number of successive production support policies such as the farm settlement scheme, the National Accelerated Food Production Project (NAFPP), the World Bank assisted Agricultural Development Project Authorities (ADPS), the Operation Feed the Nation (OFN) campaign and the River Basin Development Authorities (RBDAS). The new programmes of the second development decade (1980-1990) include the Directorate of Food, Roads and Rural Infrastructive and the Universities of Agriculture. The major initiative in the third development decade (1990-) concerns the National Agricultural Land Development Authority (NALDA). The basic policy instruments in these programmes involve revamping the extension services, revitalizing the input delivery systems, improving supply of technical inputs as well as building up of rural infrastructure. Government has operated heavy price subsidy, particularly fertilizer subsidy, as a common feature of the various schemes.

Despite these efforts, the productivity of agricultural enterprises remains at a low ebb in contrast to the industrial countries. Therefore a discussion of the agricultural economy in

relation to management functions of the farm entrepreneurs will shed light upon the critical points of embrace between the two sectors.

#### **Discernible Embrace Points:**

In this subsection we seek to substantiate the deathly embrace theory based on observations on Nigerian agricultural economy; the observed points of agriculture-industry embrace will be illuminated in relation to the role ascribed to farm management in the model.

First is the evidence of embrace in terms of structure. On the one hand, by way of number, size and completeness the market for producing primary commodities for use in industry as raw materials falls out of line with the market for utilizing agricultural raw materials (e.g cocoa, coffee, oil palm, fruits and grains) in the industry. As a result, large excess capacity exists on the agricultural sector that leads to immense wastage of farm output such as grains and fruits. On the other hand, the market for producing industrial commodities as inputs in agricultural production falls short of the capacity required to meet the demand for such items in agriculture (e.g machinery and agro-chemicals). This condition illustrates the failure on both sides of the market structure to satisfy reciprocal needs of both sectors; so proper farm management could have helped to equilibrate the enterprises in number, size and completeness to help the two sectors perform the respective roles.

Second is the evidence of embrace in terms of conduct. The conduct of the joint market system is characterized by: (i) inherent barriers to free domestic and international trade and (ii) the preponderance of government in enterprise activities.

Some of the barriers to external trade have been removed through tariff restructuring under the structural adjustment programme introduced in 1986. Internal trade in agriculture has suffered occasionally from the policies of some state government to prevent free movement

of goods and services especially during the period of scarcity, thereby distorting the national agricultural market and sending wrong signals to the management of farm enterprises.

Moreover, government was directly involved in production and marketing agricultural produce with poor definition of the objective of farm management.

Third is the evidence of embrace in terms of performance. The main issue concerns the presence of a lopsided rewards system whereby the income generating capacity of industry outweigh that of agriculture at micro and macro levels. As the rural farming community frequently undertakes an implicit evaluation of farm incomes in relative to off-farm incomes, there is the tendency for both income levels to be integrated through labour supply mechanisms. The constant movement of farm labour for work in industry reflects the perennial disparity of incomes of the sector. This puts additional pressure on farm management to devise ways and means of retaining the labour force in agriculture.

The evidenced defects in the structure, conduct and performance of the market could be addressed through policies to be determined and evaluated based on the analytical model. But more obvious is the critical role of farm management as a source of solutions to the problems as identified above. Unfortunately, the capacity and quality of management available for running farm enterprise in the country leave much to be desired. Thus activating the agricultural extension services to enrich the farm entrepreneurs with the basic tenets of farm management will go a long way in facilitating the agriculture-industry interrelationship. Specifically, farm management extension should be emphasized as an important aspect of policy intervention in the agricultural sector.

## Summary and Conclusion

The need for a distinct theory of policy intervention unique to developing economy cannot be over-emphasized. Toward this end a model is developed that characterizes the interrelationship between agriculture and industry as the dominant sectors in terms of a theoretic embrace between them which tends to slow down the pace of economic progress. Therefrom a number of hypotheses emerge concerning the inadequacies of market structure, conduct and performance responsible for slow growth, which have been substantiated with observations on the Nigerian economy.

Within this context, it has been possible to establish the role of farm management as an argument in the interactive process, as well as justify the need for policy instruments for upgrading farm management capacity in the developing economy. Farm management extension is specially recognized for this purpose to be strengthened among the class of policy instruments of agro-industrial development.

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