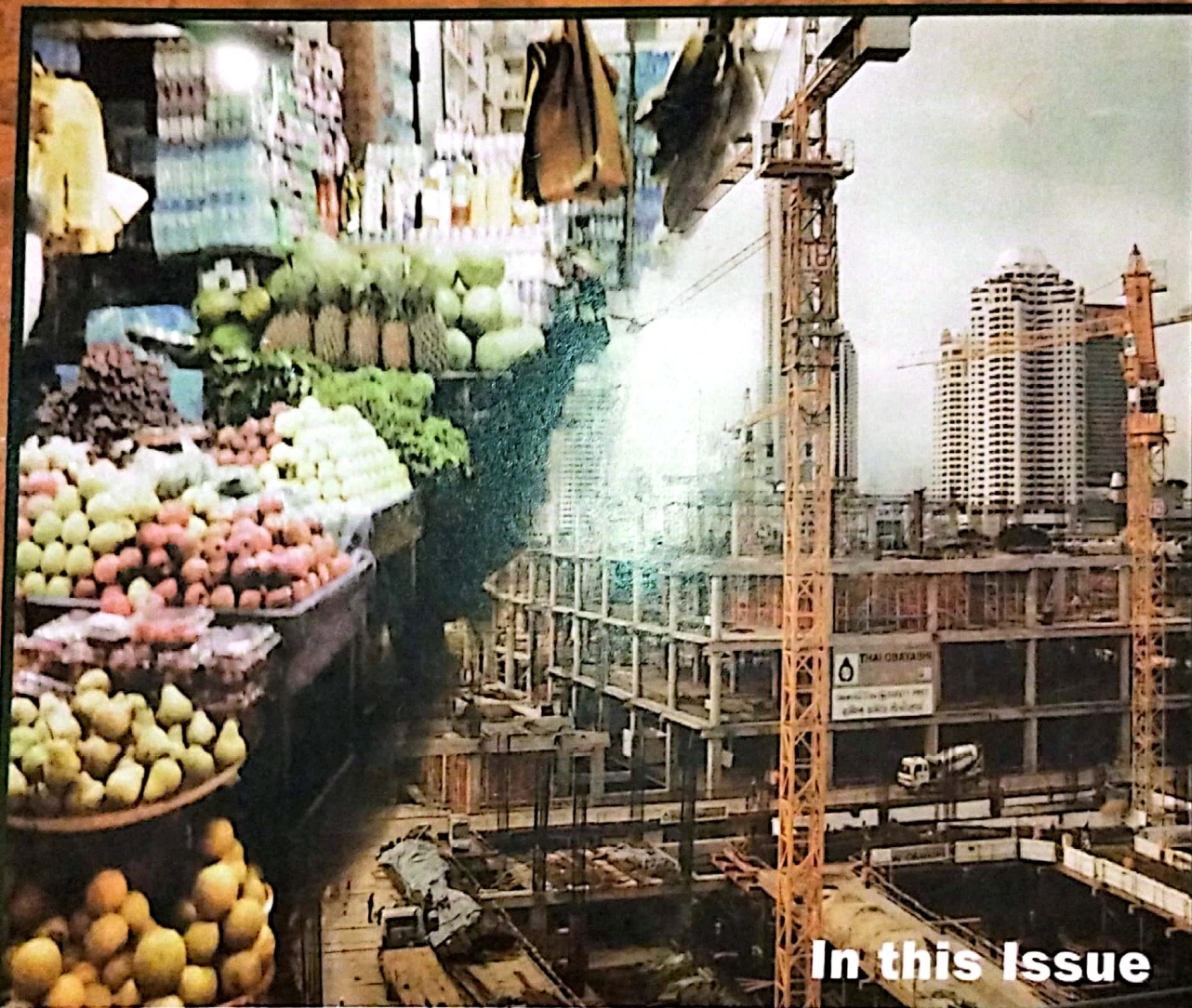


# BULLION



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# DEALING WITH RISKS AND UNCERTAINTIES IN AGRICULTURE: IMPLICATIONS FOR CENTRAL BANK OF NIGERIA INTERVENTIONS



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## Abstract

*With the majority of the population of the Nigeria living in rural areas, agriculture can be a key driver of economic and human development. However, agriculture is a risky business, especially where small and medium scale farmers often have to deal with a series of risks and uncertainties related to the weather, market, production, technology, political environment etc. The paper discusses key areas in dealing with risks in agriculture which involves much more than dealing with risky events after they occur but through a coordinated risk management processes like establishing the context, risk*

*identification, risk analysis and other quantitative analytical tools. The key institutional risk sharing systems like credit guarantee and insurance schemes were presented with their merits and demerits. The CBN on its part has put in place some risk mitigating approaches through programmes and schemes like the Agricultural Credit Guarantee Scheme Fund (ACGSF), Small and Medium Enterprises Credit Guarantee Scheme (SMECGS), The Anchor Borrowers' Programme (ABP) as well as establishing institutions (either solely or in conjunction with other stakeholders) like Nigerian Incentive-based Risk Sharing System for Agricultural Lending (NIRSAL) and the National Agricultural Insurance Corporation (NAIC). However, for risk mitigation to be effective under CBN interventions, there is need for the Bank through her linkages with other institutions and agencies to make concerted and purposeful efforts towards ensuring that risk management and coping strategies are incorporated in all loan schemes, simplified and automated risk sharing products are readily available to farmers as well as complete deregulation of the agricultural insurance space among others.*

## 1.0 Introduction

With the majority of the population of Nigeria living in rural areas, agriculture can be a key driver of economic and human development in the country. However, agriculture is a risky business, especially where small scale farmers often have to deal with a series of risks and uncertainties related to the weather, market, production, political environment etc. Risk has both positive and negative aspects, as on one hand, upward price variations for crops and livestock could offer market and investment opportunities.

On the other hand, climatic hazards, decrease in commodity prices and/or increase in input prices could create a very uncertain environment for the farmers, with unfavorable economic and social consequences. This downside risk distorts investments, puts assets in jeopardy, and makes farmers unattractive clients to financial



institutions. As a result, farmers are limited in their capacity to invest in improved and innovative agriculture methods. Banks are very reluctant to lend to farmers and when they do, it is often at very high interest rates (Sandmark et al, 2013).

These effects are even more disastrous for poor farmers, where formal safety nets are absent or very limited. An unstable environment makes it impossible or very hard for them to escape the poverty trap. Overall, the agricultural sector tends to produce less than its potential with a negative impact on society in terms of growth, rural employment and food security. Indeed, without managing risks, farmers' integration in value chains which gives them access to markets is compromised. This is especially important for operators of small and medium-sized farms who could have a surplus to sell in the market.

Following the effects of the food crisis in some parts of Nigeria, national awareness has drastically increased regarding the challenging situation of farmers. The Central Bank of Nigeria as an important stakeholder in the agricultural finance space has mobilized resources targeted at tackling this challenge and deploying systems that protect and improve local food production through targeted risk management and coping strategies like guarantees and insurance in the entire chain of agricultural operations. These approaches include programmes and schemes like the Agricultural Credit Guarantee Scheme Fund (ACGSF), Small and Medium Enterprises Credit Guarantee Scheme (SMECGS), The Anchor Borrowers' Programme (ABP) as well as establishing institutions (either solely or in conjunction with other stakeholders) like Nigerian Incentive-based Risk Sharing System for Agricultural Lending (NIRSAL) and the National Agricultural Insurance Corporation (NAIC).

Indeed, taking away the risk for farmers through these approaches could open space for innovation, unlock financial markets, and improve productivity. For these to happen however, certain challenges have to be identified, their effects x-rayed and implications drawn for prompt corrective actions by policy makers.

This paper is divided into six (6) sections. Section 1 provides a general introduction as well as the objectives of the paper. Section 2 reviews relevant literature on the subject of risk highlighting the definition, occurrence as well as classification of risk in agriculture. Section 3 describes the risk management process delving the various options available in risk mitigation, aversion and coping strategies in agriculture while Section 4 delves into the approaches of the Central Bank of Nigeria to risk mitigation in agricultural financing through programmes and schemes as well as institutional approaches. Section 5 gives detailed challenges to risk mitigation under CBN strategies while section six (6) concludes the paper giving some recommendations on what should be done to improve on risk mitigation under CBN development finance interventions.

## **2.0 Risk Mitigation in Agriculture: Conceptual Overview**

### **2.1 Definition of Risk**

Risk is defined by the Australian/New Zealand Risk Management Standard AS/NZS 4360 (2004) as 'The chance of something happening that will have an impact on objectives'. According to PMBOK (2008), risk is an uncertain event or condition that if it occurs, has a positive or negative effect on a project's objectives. Toma et al 2012, refer to risk as situations in which probabilities targets can be identified for possible results, that is, it can be quantified. Risk phenomenon is often specified in terms of an event or circumstance and the consequences that may flow from it. It is measured in terms of a combination of the consequences of an event and their likelihood. 'Likelihood' describes how often a hazard is likely to occur, and is commonly referred to as the probability or frequency of an event. 'Consequence' describes the effect or impact of a hazard on a community. Both likelihood and consequence may be expressed using either descriptive words (i.e. qualitative measures) or numerical values (i.e. quantitative measures) to communicate the magnitude of the potential impact (AS/NZS 4360, 2004).

In agriculture, agronomists and engineers tend to define risk as a loss, while economists tend to use



the word as a synonym of "probability of occurrence of a damaging event" (Chaddad, et al, 2010).

Even supposed experts use the term 'risk' in several different ways, these differences cause considerable confusion especially when systematic efforts are made to measure risk and to evaluate it. Among the many usages of the word, three common interpretations are:

- i. The chance of a bad outcome;
- ii. The variability of outcomes; and
- iii. Uncertainty of outcomes.

Although seemingly similar, these three definitions imply quite different ways of measuring risk. Moreover, when formally defined they can be seen to be mutually inconsistent. It will be argued here that, while the first two meanings are in common usage, clarity is best served by defining risk, at least for formal analyses, as the uncertainty of outcomes.

As earlier stated, risk can be quantified; however, when the information necessary for understanding and anticipating developments or changes that may occur in a particular context are either insufficient or unavailable, the situation is defined as uncertain. The key-element in making the distinction between risk and uncertainty is probability. Probability refers to a particular phenomenon or event to occur under well-defined conditions. The state of uncertainty means a set of conditions and factors, unidentified and unpredictable in terms of occurrence and evolution; even if they are identified and predicted they are highly unstable, with their probability being 0. The state of risk is when there is an economic probability that is greater than 0 but less than 1.

## 2.2 Risk and uncertainty in agriculture

Risk in agriculture is defined as an uncertainty (i.e. imperfect knowledge or predictability) because of randomness. It is regarded as the probability of losses resulting from incomplete control over the processes with which farmers are concerned (OECD, 2000). The sources of these risks and uncertainties in agriculture include, inter alia, the technical, natural, commercial and financial

aspects (Horace, 1959).

Uncertainty about the future works both ways in agriculture. For example, a farmer can win or lose depending on the outcome of events. Constraints of various other kinds also limit the farmer's freedom to make changes in the process of food production (Dalton, 1982). These may consist of simple identities such as the fact that the demand for resources cannot exceed the supply of the resources. According to Dupriez and Leener (1988), farmers are faced with many agricultural production uncertainties which prevent them from acting freely in accordance with their production plans. In such circumstances, they have to take some innumerable and highly diversified risks and uncertainties into consideration.

Uncertainties are also introduced by the legal system, the amount of arable land available, the quality and quantity of the seeds or animal breeds, moral values and also by the technical relationships that exist between activities as is the case in rotational practices. Other causes of uncertainties in agriculture are climate, diseases in man, diseases in crops and livestock and the quality of the implements used by farmers, and so on. For instance, several production factors may be missing at the same time, and if one key factor should prove deficient, say water or seeds, it may be impossible for farming operations to continue effectively and for the farmers to perform efficiently. This is because the farmers have little or no control over these factors. The following are examples of the uncertainties in agriculture which require informed decisions on the part of the farmers to be overcome:

(i) If rainfall is inadequate at the beginning of the rainy season, seeds dry up and the harvest is bound to be poor. Water is the restricting factor in this case.

(ii) If harvest is plentiful and there are not enough workers to bring in the produce, there is a labour shortage or restriction. This means that the workers on the farm are unable to harvest all the produce, particularly at the right time.

(iii) Perhaps a machine will speed up the work of the harvesters, but there is no money to buy or



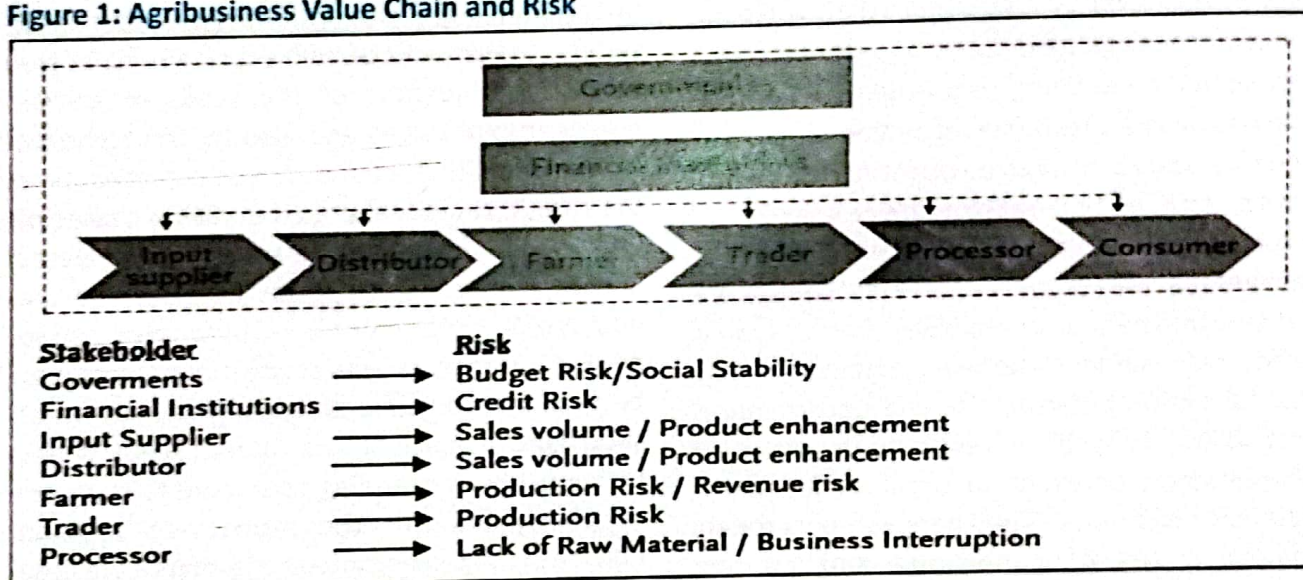
hire it. This is a money constraint.

Agricultural risks not only affect farmers, they also affect the whole agribusiness value chain. Each of the participants along the supply chain, from the suppliers of inputs to the end consumer, is subject to these risks. As the interconnections between the participants in the value chain are becoming more close and complex, the possibilities of adverse events being transmitted between participants are increasing.

The agribusiness value chain and the risks faced by each participant are detailed in figure 1. Agricultural risk management relies on an optimal combination of technical and financial tools. Agricultural value chain participants can use

several tools whenever they are available, to deal with these multiple sources of agricultural risk. Agricultural value chain players may avoid risk; for instance, by choosing not to select a particular crop or crops which they consider of high risk for the area in which their farms are located. They may also mitigate risks by seeking to lessen the risk through planting crops only in very favorable conditions or developing further their infrastructure to improve irrigation or minimize the effects of draught. Also, they may transfer all or part of the risks to a third party through an insurance contract or guarantees. They may also mitigate the financial effects of these risks by creating emergency reserves from profits in good years—a form of self-insurance.

Figure 1: Agribusiness Value Chain and Risk



Source: Iturrio (2009)

### 2.3 Classifications of agricultural risks

According to Theuvsen (2013), agriculture has always been a risky business due to the handling of living organisms and its exposure to weather conditions and other natural phenomena (such as pathogens, animal diseases etc.).

Other risks originate in the political and social environment of farms, for instance uncertainty about future agricultural and environmental policies, a growing lack of societal acceptance of intensive agriculture, and reluctance of qualified personnel to work in agriculture. Figure 2 enumerates some of the most important risks in agriculture.

OECD (2000) differentiated between risks that are common to all businesses (family situation, health, personal accidents, macroeconomic risks...) and risks that affect agriculture more specifically: production risk (weather conditions, pests, diseases and technological change), ecological risks (production, climate change, management of natural resources such as water), market risks (output and input price variability, relationships with the food chain with respect to quality, safety, new products...) and finally regulatory or institutional risk (agriculture policies, food safety and environmental regulations).

Hardaker et al. (2004) distinguish two major types



of risk in agriculture. First, business risk includes production, market, institutional and personal risks. Production risk is due to unpredictable weather and performance of crops and livestock. Market risk is related to uncertainty about the price of outputs and, sometimes also inputs, at the time production decisions are taken. Institutional risk is due to government actions and rules such as laws governing disposal of animal manure or the use of pesticides, tax provisions and payments. Personal risks are due to uncertain life events such as death, divorce, or illness. Second, financial risks result from different methods of financing the farm business. The use of borrowed funds means that interest charges have to be met before equity is rewarded which may create risk due to leverage. Additionally there is financial risk when interest rates rise or loans are unavailable.

Musser and Patrick (2001) defined five major sources of risk in agriculture. Production risk concerns variations in crop yields and in livestock production due to weather conditions, diseases and pests. Marketing risk is related to the variations in commodity prices and quantities that can be marketed. Financial risk relates to the ability to pay bills when due, to have money to continue farming and to avoid bankruptcy. Legal and environmental risk concerns the possibility of lawsuits initiated by other businesses or individuals and changes in government regulation related to environment and farming practices. Finally, human resources risk concerning the possibility that family or employees will not be available to provide labour or management.

Moschini and Henessy (2001) prefer to talk about sources of uncertainty in agriculture, singling out four different sources.

- a. Production uncertainty. The amount and quality of the output that will result from a given bundle of production decisions are not known with certainty. Uncontrolled elements such as weather conditions play a fundamental role in agricultural production.
- b. Price uncertainty. Production decisions

have to be made far in advance of realizing the final product. The price of the output is typically not known at the time the production decisions are taken. Inelastic demand is often cited as a main explanation for agricultural price variability.

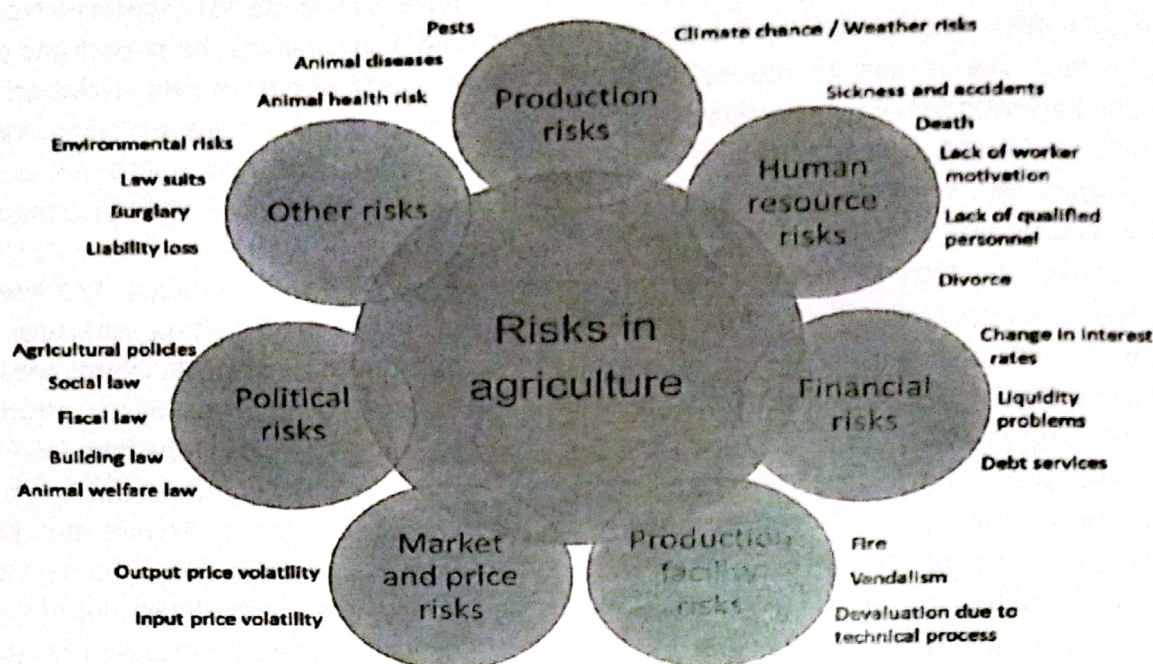
- c. Technological uncertainty. The evolution of production techniques may make quasi-fixed past investments obsolete. Research and development efforts are typically not made at the farm level but at the input supplier firm level.
- d. Policy uncertainty. Besides the general economic policies that affect agriculture as any other sector (taxes, interest rates, exchange rates...) agriculture is typically characterised by an intricate system of government interventions, changes in which may create risk for agricultural investment.

The more general literature on risk management, particularly when related to developing countries, typically includes non-agricultural specific risks in the classification. The World Bank (2000) classifies risks in six different types: natural, health, social, economic, political and environmental. They also cross this typology with an additional dimension of systemic characteristics of different risks: micro or idiosyncratic risk that affects the individual, Meso-risk affecting a whole community, and Macro or systemic risk affecting a whole region or country. All the risks they mention affect farmers in some way, particularly natural (rainfall, landslides, floods, droughts...), health (animal and plant) and environmental risks. Furthermore, most of these risks eventually take the form of economic risk that affects the stream of income, consumption and wealth.

Any classification of risks underlines the fact that an individual farmer may be facing very different risks at the same time. In these conditions, the optimal choice of a strategy to deal with them requires that correlations among risks be accounted for. Some key risks faced by farmers are shown in table 2



Figure 2: Risks in Agriculture



Source: N  ther and Theuvsen 2012.

### 3.0 The Risk Management Process and Assessment

The Risk management process includes much more than dealing with risky events after they occur. It involves the identification of risky events in the organization in advance given the likelihood and consequences of such events to react in an appropriate way. Risk management is a complex process which can be summarized in five consecutive steps (Figure 3) viz. establish the context, risk identification, risk analysis, risk assessment and risk management. These processes are backed with continuous monitoring and review.

#### i. Establish the context

Defining the context is the first step in the risk management process. It starts by identifying the relationship between the farm and its environment, taking into account the strengths, weaknesses, opportunities and threats related to the farm. The basic risk management instruments through which risks will be managed must be determined in this stage. Given the impossibility to deal with every risk all at once, some priority setting must be built in this stage by starting with risks which are expected to be more dangerous.

#### ii. Risk identification

Risks in agriculture are obviously endless. Thus,

the aim of the risk identification step is to filter those events that are predicted to have a notable effect on the attainment of the farm's performance by answering the following questions: What might happen, why and how might it happen, and how the organization might be affected (Hardaker et al. 1997).

#### iii. Risk analysis

Risk analysis seeks to estimate the chance of risk occurrence, and assess the magnitude of negative consequences. Thus, it will be able to classify risks into low/high probability/impact (Hardaker et al. 1997).

#### iv. Risk assessment

Risk assessment is concerned with decision making based on the outcome of the risk analysis step. The decision making has to include two aspects: Firstly, which risks need treatment and treatment priorities? Secondly, identification of those risks for which current risk management practices are not appropriate, so that further strategies must be developed.

#### v. Risk management

It follows the risk assessment to identify the range of treatment options such as ignorance, acceptance, reduction, avoidance and transfer of risks. After that, it proceeds in selecting and



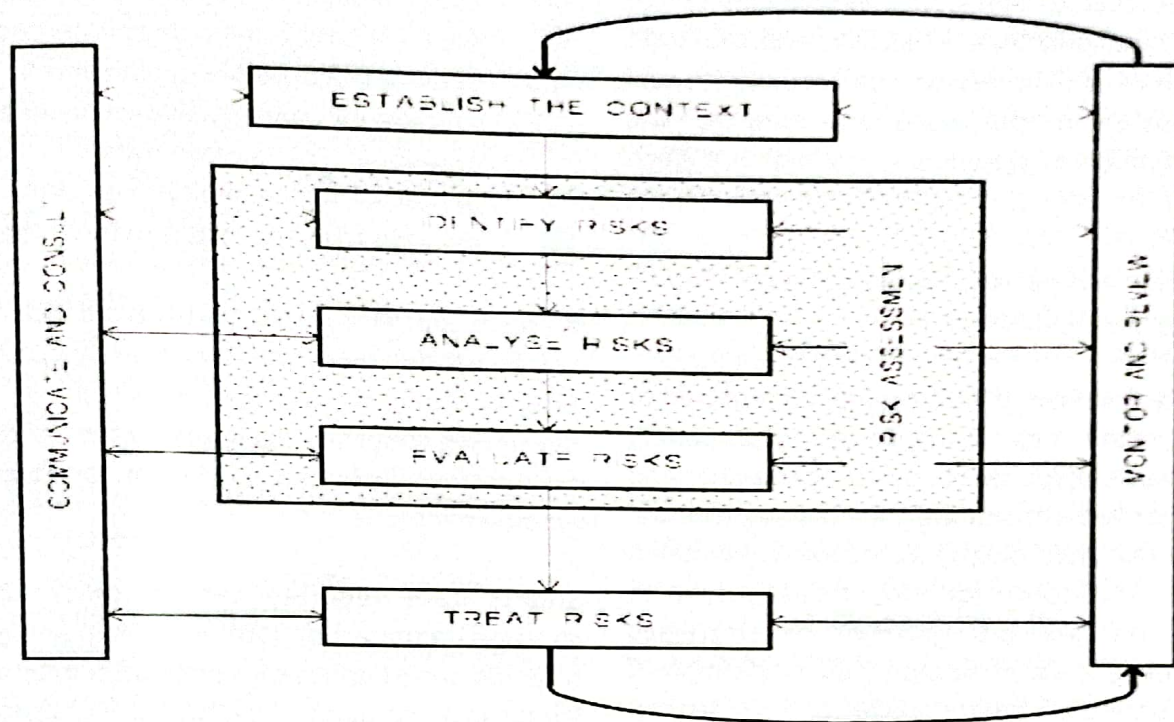
implementing appropriate options to deal with risks.

#### vi. Monitoring and review

Monitoring and review based on communication and information exchange are necessary to

ascertain that the risk management plan is working, and to identify aspects where further decisions need to be made (Hardaker et al. 1997). Perfect information access is very essential in such a step.

Figure 3: Risk Management Process



Source: Australian/New Zealand Risk Management Standard AS/NZS 4360 (2004)

### 3.1 Risk Assessment

Although being aware of a risk is clearly important, before consideration of managing it, the risk being considered must be assessed. In this regard, risks (and their impacts) are assessed by quantifying three main variables: hazard, vulnerability, and exposure (World Bank, (2011).

- a. **Hazard:** The categorization of the type of risk being considered—for example, weather, price, pest, policy, or market. The quantification of the hazard is then undertaken by assessing three subvariables:

Frequency: How often or likely is the risk to occur?

Severity: What are the likely fiscal impacts of such a risk if it occurs?

Spatial extent: How widespread would the impact of the risk be—one person? one village? one country?

- b. **Vulnerability:** This is an estimation of what the impact of the realized risk would be given the assets affected by the event and taking into account the current ability to manage the impact.
- c. **Exposure:** The identification of the location of crops, livestock, and farm holdings that may be directly impacted by the hazard. Interdependency in the supply chain leads to indirect exposure for other parties.

Clearly this process of risk assessment involves the use of a number of assumptions and variables, so risk modelling is increasingly used as a tool to allow the development of probability



estimates for financial losses. It should be noted that agricultural risk assessment is particularly dependent on the relationship between the timing of the loss event and the agricultural calendar. This is largely due to the fact that crop or livestock vulnerability varies according to the growth stage and season. In addition, risk assessment in agriculture is further complicated by the fact that vulnerability is heavily influenced by many local variables, such as soil, crop varieties, cultural practices, irrigation, and drainage. The use of and access to local knowledge and information is therefore essential to the interpretation of agricultural risk within a given area.

### 3.2 Risk Mitigation, Aversion and Coping Strategies in Agriculture

Farmers in various places have been reported to adopt some risk management and coping strategies in response to some uncertainties and risks that are encountered in their agricultural operations. According to European Commission (2006), the tools for risk management in agriculture are distinguished in strategies concerning on-farm measures (diversification of the production programmes) or risk sharing strategies like marketing contracts, production contracts, hedging on futures markets, participation in mutual funds, guarantees and insurance schemes.

According to World Bank (2011), the Agricultural Risk Management Team (ARMT) at the institution, proffered three clear approaches to risk management:

- **Mitigation** is the lessening or limitation of the adverse impacts of hazards and related disasters. Risk mitigation options are numerous and varied (for example, crop and livestock diversification, income diversification, soil drainage, mulching, use of resistant seeds, avoidance of risky practices, and crop calendars).
- **Transfer** refers to the transfer of the potential financial consequences of particular risks from one party to another. While insurance is the best-

known form of risk transfer, in developing countries the use of informal risk transfer within families and communities is extremely important.

- **Coping** refers to improving the resilience to withstand and manage events, through ex-ante preparation and making use of informal and formal mechanisms in order to sustain production and livelihoods following an event. Although we have noted that coping is an ex-post activity, it is possible to plan and to prepare for coping activities on an ex-ante basis. This is often fiscally beneficial, as the ability to quickly respond to events often reduces losses.

A fourth approach is that of risk avoidance or risk prevention. However, this is rarely possible in agricultural production, especially in developing countries like Nigeria where there are very few alternative sources of non-farm employment.

Studies have reported various other coping strategies adopted by farmers in mitigating the risks and uncertainties they encounter in terms of labour in some parts of the world. For instance, Kochar (1995) reported that labour supply adjustment rather than asset or other strategies is the main strategy used in India to avoid labour related uncertainties. Moser (1998), in his study in Zambia, reported that children were being taken out of school in response to adverse income shocks to work. Plant diseases are caused by a wide range of pests such as insects, worms, fungi, bacteria, viruses, birds, rodents and sometimes other mammals as well. The following practices are recommended for farmers to use in order to avoid, mitigate or minimize such risks and uncertainties as might be determined by specific circumstances:

- i. Sources of infection should be wiped out e.g. the nests.
- ii. Choosing disease-resistant plants for crop production and seed propagation.
- iii. Practicing good crop rotation and plant association should be maintained.
- iv. The use of chemical products should be



adopted, particularly if the farmer can afford them. This is a good means of fighting diseases and disease carriers.

v. Growing crops in mixture is also another inexpensive way of tackling the problems of pests where the farmer cannot afford pesticides.

In situations whereby farmers are confronted by economic and technical risks, some measures could be taken in order to reduce the uncertainties associated with production activities. For instance, when a farmer falls ill, when prices of inputs and outputs plummet, when unforeseeable expenses have to be covered, when land and money are short, and when transport services become inadequate etc. If cases like these occur, whether on farms, in villages, over a region or even nationwide, farmers can try the following as mitigation measures:

- i. Adapting and improving agricultural methods
- ii. Setting up reserves of food and money
- iii. Promoting mutual help schemes; and,
- iv. Making farm and village activities as varied as possible.

### 3.3 Institutional Risk Sharing Systems in Agriculture

Various institutional risk sharing systems are available in agriculture. These include strategies like marketing contracts, production contracts, hedging on futures markets, participation in mutual funds, credit guarantee and insurance schemes. The most predominant in Nigeria however are credit guarantee schemes and Insurance.

#### a. Credit Guarantee Schemes (CGSs)

A Credit Guarantee Scheme (CGS) is any scheme under which guarantees are provided to investments according to certain conditions of duration, amount, nature of transaction, the type or size of the enterprise etc which often lack the kind of collateral required by banks. There are four main types of guarantees:

- (i) Individual guarantees that provide partial coverage on the underlying principal loan amount with both borrower and lender clearly identified;
- (ii) A guarantee directed at an investment facility. This is normally employed when a developing economy already has functional capital markets in place, and medium to long term placements of investment funds need to be generated;
- (iii) Portfolio guarantees in which lending to a specified priority development sector is supported by providing a partial guarantee for a number of loans (one lender, many borrowers);
- (iv) Portable guarantees where one specific and identified borrower is given access to a guarantee and can then compare competing loan terms and offers from various lenders. However, this type of guarantee has the disadvantage of relatively high transaction costs for borrowers and lenders when dealing with new applications.

CGS arrangements are publicly driven and are organized in various corporate or legal forms, ranging from state operated financial institutions, state funded companies and government guarantees. Other forms which tend to be successful are independent private corporate entities, credit guarantee foundations or associations, mutual guarantee associations, and specialized single purpose guarantee corporations. In the latter form, it is easier to monitor efficiency since operating costs and staff time are all devoted to the same objective and it is easier to measure contributions made by each department. Finally, an adequate sharing of risk between guarantor, lender and borrower that avoids moral hazard; fast and trustworthy claim procedures, and fee arrangements that encourage guaranteed loan repayment have a bearing on a CGSs' market acceptance by lenders and borrowers and on their eventual success. The efficacy of CGSs is determined by several factors including the following:

- i. The guarantee fund's clarity of purpose of guarantee;
- ii. Leverage (i.e. value of credit generated per unit value of the guarantee fund);
- iii. Governance and management;



- iv. Geographical coverage;
- v. Targeted borrowers; and
- vi. Eligible financial services providers.

The common argument against CGSs relates to moral hazard issues stemming from the fact that CGSs weaken the will and commitment of the borrowers to repay the loan given, that they know that a guarantee fund will reimburse the lending institution. However, this threat could be reduced if borrowers value access to specific types of credit products that would otherwise be denied if they failed to repay. Lack of transparency in the presentation of financial results of most CGSs contributes to their fragility and potential misuse due to political influence that often diverges from commercial or development interests. The experiences of the Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE) in India attest to this point. However, sound governance and autonomy has been achieved in other experiences, such as that of the Rural Development Foundation in Estonia (Zander et al. 2013).

#### b Insurance

According to IICA (2008), Insurance is defined as the equitable transfer of the risk of a loss from one entity to another in exchange for a premium. The risk bearing entity is the insurance company. The company assumes this liability once it accepts payment of a premium amount determined by the insurance company. The company carefully evaluates the risks and then determines adequate premiums to cover expected loss payments, administration expenses and a profit margin. The risk transferring entity is the purchaser of the insurance such i.e. the farmer or bank. This party has determined that the risk of loss is too great to assume and so for a certain payment premium, the risk is now transferred to an entity or insurance company that can better afford the potential loss. Insurance has become a fundamental risk finance tool for mitigating risks in agriculture in many developing and developed countries.

There are two fundamental concepts of insurance, regardless of the type of insurance: "adverse selection" and "moral risk", which are

explained below. Without sufficient safeguards in place to address both adverse selection and moral risk, no insurance program will be successful.

i. Adverse selection: - This occurs when only those parties who know they will need insurance purchase coverage. Insurance companies look for a "spread of risk" much like an investment portfolio spreads risk among a variety of investments. Insuring "say" a single island in the Caribbean is much more problematic for an insurer because one loss could create losses far beyond the premiums generated over the years. Therefore due to adverse selection related issues a regional program for the Caribbean would be much more viable option.

ii. Moral risk is about fraud and corruption. Every insurance underwriter will want to make sure that in the program, the insured or agent does not misrepresent important information that could artificially reduce loss exposures and thereby reduce premiums or inflate actual losses by manipulating crop damage information

#### c. Agricultural Insurance

Most commonly today, it is the protection of specified crops and livestock against specified natural causes (e.g. drought, flood, pests and wind). It first began as insurance against hail in France and Germany during the 1820s. In the late 1800s, some farmers in the United States began a hail insurance program due to losses to their tobacco crops. This type of coverage still exists in many countries today. Then in 1938, the United States started a program to protect against a wider range of natural disasters which became known as multi-peril insurance. On some occasions, programs offer protection against price risk. Covered losses can occur to crops, livestock, and even aquaculture. Today, the agriculture insurance program is a large industry covering over \$40 billion of production risk (both yield and price) to a wide range of crops and livestock in the United States alone. Many other countries in the western hemisphere, such as Argentina, Brazil, Canada, Mexico and Spain, have also instituted various forms of agriculture insurance.



#### d. Emergence of Weather Index Insurance (WII)

Weather Index Insurance falls under the category of Index-based Insurance (IBI). Like any insurance product, the purpose of Index-based Insurance (IBI) is to compensate clients in the event of a loss. However, IBI is used to protect against shared rather than individual risk such as the risks associated with weather fluctuations, disease outbreaks or price loss. Unlike traditional insurance which assesses losses on a case by case basis and makes payouts based on individual client's loss realizations, IBI offers policy holders a payout based on the external indicator which triggers a payment to all insured clients within a geographically defined space (ibli.ilri.org).

According to IFAD (2011), the essential feature of Weather Index Insurance is that the insurance contract responds to an objective parameter (e.g. measurement of rainfall or temperature) at a defined weather station during an agreed time period. The parameters of the contract are set so as to correlate as accurately as possible, with the loss of a specific crop type suffered by the policyholder.

All policyholders within a defined area receive payouts based on the same contract and measurement at the same station, eliminating the need for in-field assessment. The typical features of a WII contract are:

A specific meteorological station is named as the reference station.

A trigger weather measurement is set (e.g. cumulative millimeters [mm] of rainfall), at which the contract starts to pay out.

A lump sum or an incremental payment is made (e.g. a dollar amount per mm of rainfall above or below the trigger).

A limit of the measured parameter is set (e.g. cumulative rainfall), at which a maximum payment is made.

The period of insurance is stated in the contract and coincides with the crop growth period; it may be divided into phases (typically three), with each

phase having its own triggers, increment and limit.

Introducing WII to an area requires willing stakeholders: insurers, national weather services and linkages for distribution and support, including Financial Services Providers (FSPs), agricultural value-chain participants and government, which provides the regulatory environment. WII is best introduced using market-based principles and business practices, but often with an important developmental and social agenda.

The payout for index-based insurance relies on the value of an index and not, as for indemnity based insurance schemes, on measurable losses. A threshold is set, below which the insurer will compensate the insured. There are two types of categories—direct and indirect indices:

a. Area yield index insurance, for which the index is directly an area average of yield, livestock mortality, or income.

b. Indirect index insurance, which relies on other kinds of underlying data, such as rainfall, temperature or vegetation indices (computed from weather stations or satellite images) correlated with losses the farmers incur on the ground.

The basic payment structure of a weather-indexed product centres around two main values: the threshold and the limit. The threshold denotes the value of the index at which indemnity payments kick in, and the limit denotes the point at which payments reach a maximum level. Indemnity payments typically increase as the index approaches the limit, with the rate of increase a function of the threshold, the limit and the actual value of the weather index (USAID, 2006).

The main advantage of Index-Based Insurance as presented on table 1, is that it avoids problems of moral hazard and adverse selection inherent in the classic Indemnity-Based Insurance. Each farmer represents one entity in a large number of producers whose combined performance (calculated by objective measures provided by



meteorological stations, satellite data, or regional-level yield data) determines the value on the index. Moreover, individual loss assessments are no longer needed which decreases the administrative costs and makes the payout process fast and inexpensive.

The transparency of the system can also facilitate the access to international reinsurance markets.

Despite these announced advantages, the aggregate premium volume for Agriculture Index Insurance remains very low and markets remain

underdeveloped, with only a few insurance contracts offered and with low take-up. The sustainability of these schemes, however, requires a very large number of clients to subscribe to the policies in order to maintain low cost premiums.

According to Burke et al (2010), Index Based Weather Insurance products are used at the institutional level in roughly 22 countries including; Columbia, Ethiopia, Mexico, Malawi, Mongolia and 16 Caribbean countries.

| Policy Holder                                                          | Sales or Distribution Model                                                                                                                                                                                                                                                                                                             | Potential benefits of WII                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Micro Level</b>                                                     |                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                           |
| Farmers<br>Households<br>Small businesses                              | Farmers buy insurance as part of a package (e.g. credit and other financial services, technology, agricultural information) or occasionally as a stand-alone product<br>Note: FSPs, farmers' associations, processors, input suppliers or NGOs can also act as a distribution channel for micro products retailed to individual farmers | WII payout can:<br>Allow farmer to avoid default and restart production<br>Compensate for additional livestock feed costs<br>Provide income support in lean periods<br>Supplement other sources of household income that may be disrupted<br>Facilitate access to credit<br>Encourage investment in higher-quality inputs |
| <b>Meso</b>                                                            |                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                           |
| FSPs<br>Processors<br>Input suppliers<br>Farmers' associations<br>NGOs | Meso-level institutions buy WII policies (e.g. portfolio or group insurance) to protect their own exposure, and may create payout rules that directly or indirectly benefit farmers                                                                                                                                                     | WII opens access to a new client base and helps manage mass defaults caused by weather shocks<br>Meso-level actors can develop innovative linkages along the supply chain (e.g. contract farming, packaging of credit, and inputs) to help manage their risk and open market opportunities                                |
| <b>Macro</b>                                                           |                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                           |
| Government (or relief agencies)                                        | Government or relief agency is reinsured                                                                                                                                                                                                                                                                                                | Government receives early liquidity following disasters; relief agency is able to fund operations                                                                                                                                                                                                                         |

Source: IFAD (2011)



#### e. Satellite based index insurance

Founded on the Weather-Based Index model, insurance products have been developed using satellite imagery instead of data collected by weather stations. Unlike other sources of information, satellite imagery offers detailed data for entire continents over many years. From those images, indices are built and are correlated with the lifecycle of the crop. Just like Weather-Based Indices, Satellite-Based Indices necessitate thorough studies on the link between the index and the actual yield. These models are however expensive to set up. An example of a Satellite-Based Index is the Normalized Difference Vegetation Index (NDVI). This index provides an assessment of plants' absorption of moisture through their ability to perform photosynthesis. Charted on a scale between -1 and 1, the closer the index is to 1, the higher the absorption capacity.

#### 4.0 CENTRAL BANK OF NIGERIA'S APPROACHES TO RISKS MITIGATION IN FINANCING AGRICULTURE

The Central Bank of Nigeria intervenes in the real economy in order to achieve a variety of economic objectives. This is driven by the need to provide enabling policy environment for increased lending to priority sectors, improve the access of Nigerians to affordable and long term funds to fast-track real sector development and de-risk lending to encourage financial institutions to finance priority sectors among others. The agricultural sector, which is considered high risk by financial institutions in Nigeria, constitutes an important area of CBN intervention.

Towards de-risking lending to the agricultural sector, the CBN employs the following approaches:

- a. **Programmes and Schemes Approach** – Here the Bank establishes Programmes and Schemes that seek to reduce risks faced by banks in lending to agriculture, thereby enhancing lending to the sector. The Programmes and Schemes created by the Bank with a view to reducing agricultural and other associated risks include; the Agricultural Credit Guarantee Scheme Fund (AGSF), Small and Medium

Enterprises Credit Guarantee Scheme (SMEGCS) and the Anchor Borrower's Programme (ABP).

- b. **Institutional approach** – Here the Bank either independently or in conjunction with Federal Government and other stakeholders sets up institutions with specific roles in de-risking the agricultural value chain. These include institutions like the Nigeria Incentive Based Risk Sharing System for Agricultural Lending (NIRSAL) and The Nigerian Agricultural Insurance Corporation (NAIC).

#### 4.1 Programmes and Schemes Approach

##### i. **Agricultural Credit Guarantee Scheme (ACGSF)**

The Agricultural Credit Guarantee Scheme was launched in 1977 to reduce the risk borne by commercial banks in extending credit to farmers. Under this scheme, the Central Bank of Nigeria guaranteed up to about 75% of the value of the principal and interest on loans granted to farmers by any commercial bank up to a maximum of N20,000.00 for individuals without tangible collateral, N1,000,000.00 to individuals with adequate and realizable collateral and N10 million for loan to cooperatives and corporate bodies with adequate and realizable collateral. Borrowers also enjoy a rebate of 40 per cent of the interest paid after repayment as and when due. The total loan guaranteed from inception in 1978 to May 2018 is 1,109,164 valued N111.236 billion.

##### ii. **The N200 billion Small and Medium Scale Enterprises Guarantee Scheme (SMEGCS)**

The scheme was established in 2010 to fast track the development of the sector, set the pace for the industrialization of the economy and increase access to credit by small and medium enterprises and entrepreneurs. The scheme provides guarantees on loans by banks to the sector in order to absorb the risks that had inhibited banks from lending to the sector. The beneficiaries of the scheme are small and medium enterprises with total assets not exceeding N500 million and a labour force of 11 to 300 staff. A maximum



amount of N100 million would be guaranteed which could be in form of working capital, term loan for refurbishment or equipment upgrade or expansion and overdraft. The total number of projects guaranteed since inception to date stood at 88 (Eighty Eight), valued N4.251 billion. All the guaranteed projects under the scheme have been fully repaid.

### iii. The Anchor Borrowers' Programme (ABP)

The Central Bank of Nigeria in line with its developmental function established the Anchor Borrowers' Programme with a view to collaborate with anchor companies involved in the production and processing of key agricultural commodities.

The Programme is designed to help local farmers increase production and supply of feedstock to

processors, reduce importation and conserve Nigeria's external reserves. Under the Scheme, anchor firms serve as off-takers in recognition of their track record and experience in working with out-growers involved in production. The Scheme involves a finance model whereby the anchor firms, CBN, NIRSAL and State Governments organize the out-growers and ensure that they comply with contractual terms thereby reducing the incidence of side-selling.

The financing institutions serve as veritable channels for delivering credit to the out-growers. As at September 2017, the sum of N45.43 billion had been disbursed under ABP to 216,257 farmers across 30 States in Nigeria.

A comprehensive risk mitigation strategy has been incorporated into the ABP model as presented in table 2.

| S/No | Risks                                                                                                                                                              | Mitigants                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Poor farming techniques/low crop yield                                                                                                                             | Comprehensive farmer education/technical assistance                                                                                                                                                                                                                                                                                                                                                                                                                |
| 2    | Skill gap among credit officers in agricultural financing                                                                                                          | Value chain finance training for bankers                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 3    | Poor monitoring of the process/project                                                                                                                             | PMT comprising all stakeholders in place                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 4    | Farmers have no commitment in the Programme                                                                                                                        | Equity contribution of 5% - 10%                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 5    | No market for products                                                                                                                                             | Off-takers in place with MOUs executed                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 6    | Price variation                                                                                                                                                    | Guaranteed Minimum Price by FMARD in place                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 7    | Loss of crops due to floods/drought/natural disasters                                                                                                              | NAIC Agricultural Insurance is compulsory                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 8    | Poor quality/fake inputs leading to low yields                                                                                                                     | PMT selects recognised agro dealers                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 9    | Diversification of funds by farmers                                                                                                                                | Direct disbursement to agro dealers                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 10   | Side selling by farmers                                                                                                                                            | <ul style="list-style-type: none"> <li>Farmer selection by miller</li> <li>Cross guarantee by all members of the cooperative</li> <li>Miller approves all disbursement requests by farmers</li> <li>Use of extension workers</li> <li>MOU to be executed between the millers, farmers and financing banks to curb the incidence of Side Selling</li> <li>Cooperative which farmer belongs to be excluded from the Programme and from future CBN funding</li> </ul> |
| 11   | Default by Miller <ul style="list-style-type: none"> <li>No funds to purchase paddy</li> <li>Reneges on MOU agreement</li> <li>Diversification of funds</li> </ul> | <ul style="list-style-type: none"> <li>CACS funding available for direct purchase of paddy</li> <li>Miller will be banned from future CBN funding</li> <li>Bank debits miller account and credits loan accounts of farmers</li> </ul>                                                                                                                                                                                                                              |
| 12   | Default in loan repayment by farmers                                                                                                                               | 50% on credit risk in the event of default                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 15   | Challenges of Infrastructure                                                                                                                                       | Government to provide infrastructural facilities like Fadama feeder roads, irrigation facilities etc                                                                                                                                                                                                                                                                                                                                                               |

Source: CBN 2015



## 4.2. Institutional Approaches to Managing Risks in Agriculture

### a. The Nigerian Incentive-Based Risk Sharing System for Agricultural Lending (NIRSAL)

The Nigerian Incentive-based Risk Sharing System for Agricultural Lending (NIRSAL) is an agricultural financing initiative of the CBN aimed at providing farmers with affordable financial products, while de-risking agriculture and unlocking the access of input suppliers, farmers, agro-processors, and product marketers in the agricultural value chain financing from financial institutions. NIRSAL was

Incorporated in 2013 as a Non-Banking Financial Institution, designed to appropriately define, measure, price and share agribusiness related credit risk. It operates as an autonomous private sector institution with a distinct governance structure governed by a Board of Directors. NIRSAL is a \$500Million public liability company wholly owned by the Central Bank of Nigeria.

#### i. Major Components (Pillars) of NIRSAL

The NIRSAL financing mechanism is based on five solution components namely: Risk Sharing Facility, Insurance Component, Technical Assistance, Agricultural Bank Rating and Bank Incentive mechanism (Table 3).

Table 3: The Five (5) Pillars of NIRSAL

| Risk Sharing Facility (\$300M)                                  | Insurance Facility (\$30Million)                                             | Technical Assistance Facility (\$60M)                                                                                                             | Agricultural Bank Rating Scheme (\$10Million)                                                                                                                             | Bank Incentive Mechanism (\$100 Million)                                                                                                                |
|-----------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Shares lending risks with banks (e.g. 50% of any loss incurred) | Links insurance products to the loan provided by banks to loan beneficiaries | ? Builds the capacity of banks, micro-finance institutions<br>? Builds the capacity of agricultural value chains<br>? Expands financial inclusion | ? Rates banks according to effective-ness of their lending to agriculture.<br><br>? Rates AVC Actors According to Financial, Agribusiness Growth, Tech. Adopt Performance | ? Provides incentives that: move banks to a long term, strategic position and commitment to agricultural lending<br>? Reward Performances by AVC Actors |
| De-risk agriculture finance value chain                         |                                                                              | Build long-term capacity                                                                                                                          | Institutionalise incentives for agriculture lending & AVC Performance                                                                                                     |                                                                                                                                                         |

Source: NIRSAL Plc (2017). The Roles of Agent Networks in Reaching the Last Inch of the Last Mile

#### ii. NIRSAL's Role in De-risking the Agricultural Value Chain

NIRSAL's core responsibility is to de-risk the agricultural value chain so that banks can lend to the sector with confidence. In this regard, it is NIRSAL's mandate to x-ray reasons why these financial institutions do not lend enough to Agriculture, and devise strategies that will enhance lending to the sector.

NIRSAL absorbs a large chunk (up to 75%) of the

risk, to enable banks and other lenders to lend to agriculture more frequently and comfortably. In this regard, NIRSAL Smoothens the Relationship Between Lenders and Borrower. Banks benefit from the business of lending, because they gain interests from it; and farmers need to borrow, because they can grow their agribusinesses with more money. Therefore, wherever and whenever the interests of the lender (Bank) and the borrower (Farmer) match, NIRSAL ensures that both parties can build a secure business relationship.



NIRSAL also has a programme which it applies to aid the borrower (Farmer) to enable him succeed called the Interest Drawback (IDB). Here, for borrowers that repay their capital and interest as and when due, they regain (from NIRSAL) up to 40% of the interest charged by the lender after every 90 days cycle, effectively reducing the cost of the loan. This is to encourage faithful repayment of loans which will foster the entrenchment of a fluid relationship between Lenders and Borrowers in the Agricultural Sector.

The specific achievements of NIRSAL since its incorporation in 2013 include:

- i. Provision of Credit Guarantees for over 454 Agricultural projects valued at N61.161 billion
- ii. Pay out of over N753.36 million as interest rebate to borrowers who paid back their loans in good time.
- iii. NIRSAL has guaranteed up to 40% (207) of the Federal Ministry of Agriculture's Growth Enhancement Scheme (GES) projects Valued at N39.49 Billion and Paid Interest Draw Back to GES beneficiaries on 91 Projects valued at N439.09.82 Million
- iv. Trained 112,000 farmers/primary producers in 4 value chains: Rice, Cocoa, Cotton and Tomato

#### a. The National Agricultural Insurance Corporation (NAIC)

The National Agricultural Insurance Corporation (NAIC) was established in 1987 to operate and administer the Nigerian Agricultural insurance scheme. It was created based on a reserve fund for payment of indemnities contributed by the Federal Government, Central Bank of Nigeria, State Governments, and Development Banks etc. The institution was established for the benefit of all categories of farmers either in groups or as individuals. In addition to individual clients, the Scheme operations cover all agricultural loans from banks, public funds, various levels of government and the Bank of Agriculture (BOA). The approved premium rate for the Scheme ranges between 5per cent and 8per cent of the sum insured for crops and 3.5 per cent-7.5 per cent for

livestock. The National Agricultural Insurance Company Scheme is subsidized to the tune of 50 per cent by the Federal and State Governments in the proportion of 37.5 per cent and 12.5 per cent respectively. The farmer is required to pay only 50 per cent of the premium payable. Currently, NAIC has an outreach of about 500,000 farmers in Nigeria. The corporation has, since inception, issued out almost a million policies earning a premium sum of about N2 billion and settled claims worth about N500m to various farmers and cooperative groups. NAIC's performance by premium received and claims paid in year 2014 and 2015 indicates that N1.179 million and N1.073 million were received as premiums in 2014 and 2015 respectively while N3.495 million and 42.910 million were paid as claims in the same period respectively (NAIC, 2015).

#### 5.0 Challenges to Risk Mitigation in CBN's Agricultural Finance interventions

I. Dysfunctional extension system that seldom educates farmers on how to deal with agricultural risks:- Under ideal conditions, agricultural extension should among other roles educate farmers on the existence of risks and uncertainty in agriculture and the presence of institutional arrangements to help mitigate against such risks.

However, it has widely been reported that the performance of agricultural extension systems have fallen short of expectations, in view of the fact that it has not been able to generate much adoption of Improved agricultural technologies especially risk sharing systems like guarantees and insurance. Knowledge about the existence and usefulness of risk sharing thus is hardly known to Nigerian farmers hence patronage to such products is very low and therefore affect their participation in CBN agricultural finance interventions.

ii. High rate of information asymmetry: The Nigerian agricultural landscape is dominated by informal providers with their activities and operations not captured in the mainstream financial sector therefore difficult to be reached with risk sharing services like guarantees or insurance. This leads to preponderance of risks in agriculture and its continued threat to



agricultural development.

- iii. Financial institutions' inability to assess the level of risks involved in agriculture as well as lack of capacity to develop suitable products to meet the needs of rural clients. This is a real challenge to agricultural lending which makes banks to shy away from lending to the sector.
- iv. High cost of doing business in the rural areas where most small scale farmers are based. This is especially with respect to inspection and monitoring to obtain information on scattered farms.
- v. Political instability and social insecurity have hindered deep penetration of risk sharing and transfer facilities e.g. guarantees and insurance to some areas in Nigeria
- vi. High premiums charged by private insurance companies leading to inability to afford insurance coverage by poor rural people
- vii. Government policies and subsidies that favours NAIC as sole insurer of government sponsored agricultural programmes to the detriment of private insurance companies
- ii. CBN should make a regulatory requirement for all agric. desks staff in banks to be well trained in risk management in relation to agricultural value chain, so as to better serve their agricultural clientele.
- iii. Need for CBN to liaise with National Insurance Commission (NAICOM) towards the complete deregulation of the agricultural insurance space to create a level playing ground for both private and public institutions. Other insurance firms should be allowed to compete with NAIC in government sponsored agricultural finance programmes at all levels.
- iv. There is a need for CBN to enhance their credit facilities delivery through the use of Information and Communication Technologies in their operational framework. This will scale up information sharing and also keep farmers abreast with market situations in terms of prices of commodities, availability or otherwise of inputs and implements etc. In addition, the administration of risk management and coping strategies under CBN initiatives should be automated and simplified so that farmers could apply by using their hand sets.

## 6.0 Conclusion and Implications

The challenges faced by the agricultural sector in Nigeria due to risks and uncertainty are both numerous and enormous especially if their production is to be enhanced from subsistence to income generation based. They will need consistent financial support backed by effective and efficient risk sharing instruments. Towards better management of risks in Nigerian agriculture, the following are recommended:

- i. Incorporation of mandatory risk management/coping strategies modules in capacity farmers' building programmes for all CBN agricultural credit schemes and programmes to curb information asymmetry.
- v. CBN through its linkages with Federal and States' Ministries of agriculture should encourage the resuscitation and overhaul of the extension system by government and managing of risks in agriculture as to constitute the extension services terms of reference. Here, every State government that expresses interest to participate in CBN schemes must commit to train its extension agents in agricultural risk management strategies.



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