

# **RESEARCH ARTICLE**

#### AGRICULTURAL MARKET INFORMATION GOVERNANCE: A CAPABILITY-ORIENTED NATIONAL FRAMEWORK FOR BENIN REPUBLIC

#### Miton Abel Konnon<sup>1</sup>, Abdou-Aziz Sobabe Ali Tahirou<sup>2</sup>, Ismail M. Moumouni<sup>3</sup> and M.F. Dieu-Donné Konnon<sup>4</sup>

- 1. Laboratory of Processes and Technological Innovations, National University of Sciences Technologies, Engineering andMathematics, Abomey, Benin.
- <sup>2.</sup> Laboratory of Electrotechnics, Telecommunications and Applied Computing, University of Abomey-Calavi, Benin.

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- 3. Laboratory of Research on Innovation for Agricultural Development, University of Parakou, Benin
- 4. COTEF SARL, Cotonou, Benin.

## Manuscript Info

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### Abstract

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#### Key words:-

Agricultural Market Information, Information Governance, Information Governance Capability Information technologies are improving the Agricultural Market Information delivery to the beneficiaries. The conceptualization of the governance of disseminated information, used by stakeholders to take important decisions, has become urgent. Therefore, the aim of this work is to design an Agricultural Market Information Governance Framework (AMIGov) focusing on governance capabilities of Benin. The designed capability-oriented Agricultural MarketInformation Governance frameworkextends the existing Governance model of the Harmonized Information System of Agricultural Markets of Benin. AMIGov is a three capability vertical layers framework with described practices to support each capability layer for achieving the Governance vision. The novelty of AMIGovlies in the use of three main principles: (i) differentiation of governance and management functions and roles; (ii) horizontal interactions between key stakeholders (co-governance of the Market Information with the involvement of the public and private sectors); (iii) compliance assessments at different levels across the country. Three key governance roles are suggested to improve the Governance practices: theNational Agricultural Market Information Leadership Group, the Information Governance Committee and the Information Governance Team. TheInformation Governance Team is theofficial operational workforce responsible for performance evaluation, and various compliance assessments(risk, regulatory, deployment, information quality). This team controls the actions of the Information Managerson the basis of predefined criteria and Service level Agreement, and reports to the Governance committee. The proposed framework can be recommended for use in the countries with a low level of digital organizational culture or where the MarketInformation Governance is not standardized.

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#### **Corresponding Author:- Miton Abel Konnon**

Address:- Laboratory of Processes and Technological Innovations, National University of Sciences Technologies, Engineering and Mathematics, Abomey, Benin.

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### Introduction:-

The rapid spreading of Information and Communication Technology (ICT) from the 1980s led to the redesign of organizational principles and associated business processes focusing on IT capabilities(Venkatraman, 1994). Therefore, the concept of Information Management (IM), which is closely linked to the information lifecycle, is undergoing changes depending on the complexity of ICT and new business processes. In the past years, thisterm is used interchangeably withthe concept of Information Governance(KooperandMaes, 2011). However, from the point of view of ICT scientists, Information Governance (IG) involves the establishment of a framework to effectively support the Information Management(KooperandMaes, 2011; Khatri and Brown, 2010; Otto, 2011). The concept of IG emerged with (i) the growth of IT investment in order to support the corporate governance (Weill and Ross, 2004; Peterson, 2004) and (ii) the adoption from the 2000s of compliance initiatives that are IT-oriented, or affect the business processes supported by IT(Weill and Ross, 2004; RaczandWeippl, 2010).

The question offramework design, focusing on the alignment of business-strategy, processes, IT and people in order to achieve performance goals, becomes acute with the intensive integration of ICT in all sectors including the agricultural sector.

The impacts of ICT integration in Agricultural Market Information Systems (AMIS) in developing countries wereevaluated in several papers in thepast years (Nugroho, 2021;Ouedraogo, 2019;FAO, 2017;Galtier et al.,2014;Magesa et al., 2014). The use of ICTs provides several benefits related to the information dissemination, such as improving the farmer ability to engage with the market (obtaining higher prices, finding buyers, consumer needs discovery etc.) and thereby increasing their livelihoods. However, many challenges remain, including:

- 1. Hiding market information strategy by some traders' groups (Nugroho, 2021);
- 2. Insufficient use of ICTs due to the lack of capabilities (Nugroho, 2021;Ouedraogo, 2019);
- 3. Managing price variability risks related to price anomalies(FAO, 2017; Kym and Bruckner, 2012);
- 4. High quality data acquisition through an economical pathway (Islam and Grönlund, 2010; CTA, 2015);
- 5. Management of "Food Security Information" and "Early Warning System" (FAO, 2020);
- 6. Appropriate business model to guarantee financial sustainability(Magesa et al. 2014).

The Republic of Benin (Benin, West Africa) is also facing the above-mentioned challenges, although since 2014, several initiatives in terms of normative and strategic documents and projects, demonstrate a high innovation propensity of Benin to make the integration of ICT in agriculture a reality. Specifically, an important number of Agricultural Market Information System (AMIS) projects was lunched by the public and private sectors. According to an investigation carried out in 2020 "the institutionalization of ICT in agricultural system in Benin is now suffering from a low innovation capacity and practice" (Gouroubera et al., 2020). This situation evokes the multifacets problem of AMIS efficiency and sustainability in developing countries and particularly in Benin.

One of the facets of the above-mentionedissue is the lack of a framework for the AMI Governance in Benin.In the ICT world, the term information is a determining business resource independent of the supporting IT. Considering this conceptualization, despite the similarities, there are considerable subtle distinctions between the concepts of Information Governance and IT Governance (Kooper et al., 2011). Analyzing the complementarity and integration of IT with other organizational assets to create effective Information Systems (IS) from business perspective, some authors concluded that "IT and the IS will not emanate so muchfrom the tangible assets in which they are materialized, but rather from the way theyare used and from the services that accompany them" (Devece et al., 2016). Therefore, the actually availableInformation Governance-oriented approaches to govern Agricultural Market Information, without an efficient Information Governanceframework, can only lead to mitigated results in developing countries.

Relevant agricultural market information is generated through field data processing procedures using IT. Once available, market information is disseminated using (i) the technological resources of the information system in which it is created or (ii) the resources of a partner of the ICT sector (Radio, mobile telephony etc.). When in use, received market information could be combined with other data by any stakeholder to produce new valuable information. Consequently, to regulate the market through relevant information, Kooper et al. argue that "the proper use and application of information (and not only its creation) is of vital importance and hence appropriately a candidate subject for governance" (Kooper et al., 2011). In a recent technical report published by the European Commission on the open data, "the quality of deployment of the published data", "data formats and licenses" across a country are studied as important criteria of compliance(European Commission, 2022).

A key recommendation to improve the AMI Governance is the strengthening of public-private partnership(Weber et al. 2005, FAO, 2017), where the public sector must play the role of leader. The development of an IG framework to meet the AIM needs should offers new opportunities for a different approach to governing the sense making interactions (Kooper et al., 2011). Therefore, by proposing a national framework for the AMI Governance (AMIGov), this study intends to improve the Benin innovation capacity and to facilitate the Governance practices of AMI in Benin focusing on the capabilities of all stakeholders.

Apart from section 1, this paper is organized as follows. Section 2 is devoted to the used methodology. Section 3 presents the literature review. The AMI Governance framework is proposed in Section 4 and discussed in Section 5. Section 6 concludes this paper with some perspectives.

### Methodology:-

This research was conducted during three important phases.

**Phase 1.** The first phase of this study was devoted to the literature review on design of frameworks for Information Governance focusing on the integration of ICT. Considering that the conceptualization of IG and IM from digital perspective is recent, the literature research was carried out by exploring ICT integration approaches in public and private sectors in developed and developing countries.

**Phase 2.**The second phase took into consideration a wide range of normative and strategic documents, studies and workshop reports related to Agricultural Market Information Systems and ICT regulation in Benin. Then, some interviews were conducted with representative key stakeholders of existing AMIS to draw up a global and then a detailed overview of AMI ecosystem in Benin including used IT, Information Systems, roles and responsibility, policies and management mechanisms.

**Phase 3.**In the third phase, after in-depth SWOT analysis of existing AMIS, a national capabilities AMI Governance framework was proposed for Benin.

#### Synthesis of field interview and literature review

This section presents the theoretical background of this study and the analysis of field interviews conducted in order to appreciate the AMI ecosystem in Benin.

#### **Definition of key concepts**

In this work, the next definitions are used(Sanchez et al. 1996):

**Definition 1** (Capabilities): "repeatable patterns of action (activities) in the use of assets to create, produce and/or offer products to a market".

**Definition 2** (Asset): "anything tangible or intangible the firm can use in its processes for creating, producing and offering its products (goods or services) to a market".

#### **Information Governance**

In the existing literature, there is no commonly agreed definition of InformationGovernance (IG). The concept of IG in certain contexts referred to Information Management (IM). Sometimes, the term IM is defined as a component of IG and vice versa. According to the International Organization for Standardization(ISO), the Information Governance ensures the leading function of Information Management by defining the management line decisions (ISO/ICE, 2008). Fundamentally, IG is a framework that provides strategic incomes to effectively support the Information Management. Implementing IG is a more efficient and cost-effective multi-dimensions approach to managing information than using only IMbest practices(IBM, 2014).

"Governance is generally interpreted as a hierarchical framework for guidelines, policies, responsibilities, and procedures to ensure a certain level of control within an organization" (Kooper et al., 2011). From business perspective, three Governance approaches were proposed by Kooiman(Kooiman, 2003): (i) Hierarchical model based on steering and control (ii) Co-governance model based on common interests of all stakeholders, autonomy principle and absence of central dominating governing actor (iii) Self-governance based on self-designing systems for governance.

Models similar to the Co-governance model of Kooiman have been strongly recommended for IT-Governance(Petersen, 2004;Kooper et al., 2011). For example, Peterson argue that "IT governance needs to focus on Horizontal Integration Capabilities (HICs), which describe the ability to coordinate and integrate formal and informal IT decision-making authority across business and IT communities"(Peterson, 2004). He designed a

framework based on three distinct IT Governance capabilities:(1) Structural Capability for enabling horizontal connections between business and IT management;(2) Process Capability for rules and procedures formalization; (3) Relational Capability for enabling active collaboration between key stakeholders in order to solve integratively complex problems in dynamic environments.

Analyzing the results of detailed interviews conducted in 2013 and the IT Governance framework of Peterson, Tallon et al. introduced three categories of practices to govern information: structural, procedural, and relational(Tallon et al., 2013). The proposed frameworks by Peterson and Tallon et al. represent the foundation of this work.

IBM, one the leading worldwide company of the ICT sector, published in 2014 a redbook on new approaches of Information Governance(IBM, 2014). The IG Capability Framework of IBM was presented focusing on eleven key disciples. The framework is designed using the layered approach. At the top layer, the governance vision is presented as the combination of Value creation and Data risk management (security, privacy and compliance objective). The supporting layer is the foundation of the core disciplines layer. The fourth and the last one is the Enablers layer that enhances the core disciplines through policy, organizational awareness and stewardship. The IBM Framework is an improved model for Information Governance.

In her overview on a new paradigm to govern information, Fisher addressed four key roles with the associated accountabilities that many organizations are using when establishing Information Governance Steering Committee (Fisher, 2017): (1) Executive leadership; (2) Inclusive representation playing the role of Governance committee; (3) Working teams responsible for operational managementand; (4) Information stewards responsible for procedural controls. The idea of inclusive representation refers to the concept of co-governance advocated by Kooiman and Petersen.

#### Agricultural Market Information Systems Governance in Benin

The AMI Governance practices observed in Benin are linked to the deployment of Agricultural Market Information Systems (AMIS). This governance, which should be a form of ICT-governance, is more apparent to Information Management through its lifecycle.

AMIS began to be promoted in developing countries, including Benin, in the 1980s after market liberalization in the agricultural sector. All of these first-generation AMIS were based on a similar model: they covered a single product type, focused solely on price and were broadcast by radio, public static display, and funded by projects (Galtier et al., 2014). Communication and dissemination of information through rural channels have long been one of the priorities of Benin's agricultural policy (Kunzler and Tassou, 2004).

The emergence of ICT towards the end of the 1990s led to the deployment of second-generation AMIS, under the influence of farmers' organizations and in the context of regional markets integration. The ICT integration to AMIS hasintroduced many technical and organizational innovations. Four main categories of AMIS have been deployed in Benin:

1. Public AMIS promoted by the Ministry of Agriculture;

- 2. AMIS deployed by Professional Organizations that have become powerful the past years, and by various NGOs;
- 3. AMIS associated with a commodity exchange (rice);
- 4. Private AMIS promoted by digital services providers or Projects/Programs of the agricultural sector.

Key results of the SWOT analysis of Beninese AMIS are presented in figure 1.



Figure 1:- Key results of the SWOT analysis of AMIS in Benin.

### The National Harmonized Agricultural Market Information System

In Benin, no public AMIS is currently functional, however there are some ongoing private AMIS experiences.Specifically, a partnership agreement was signed with one of the private AMIS to create the Harmonized Information System of Agricultural Markets (H-ISAM) of BENIN under the leadership of the Ministry of Agriculture(MAEP, 2021). Various stakeholders are participating actively in the harmonization process, specifically they are four main actors:

- 1. the manager: Federation of Producers' Unions of Benin (FPU-Benin);
- 2. public structures: Department of Information Systems (DIS); Department of Agricultural Statistics (DAS), Technical Unit for Monitoring and Support for Food Security Management (TU/MSFSM);
- 3. partners: Technical and Financial Partners, projects and programs, NGOs;
- 4. Customer representatives: Professional Agricultural Organizations, private companies, NGOs, projects and programs, associations, public structures.

In the Technical Note on the HarmonizedInformation System of Agricultural Markets of BENIN, the governance of the H-ISAMis based on authors-oriented mechanisms(MAEP, 2021). The proposed Framework is not devoted specifically to the Agricultural Market Information Governance, but to the Governance of The System (technical and business) of Agricultural Market Information. To meet the basic and emerging information requirements of all market stakeholders, the design of the IG framework is needed and should go beyond the traditional hierarchical structure by taking into account the sense making interactions.

#### Design of effective AMI Governance framework

The proposed framework for the AMI Governance in Benin using the design approach described in section2 is presented on figure 2.

The synthesis of the field interview and literature reviewhelp to identify three main design principles: (i) differentiation of governance and management functions and roles in the capability approach; (ii) horizontal interactions between key stakeholders (co-governance of the Agricultural Market Information based on public-private partnership); and (iii) various compliance assessments at different levels across the country. Compliance assessments(risk management, regulatory, deployment, information quality)are fulfilled at the Information Management level on regular basis, and at the Information Governance levelon periodical basis.



Figure 2:- The Capability-oriented AMI Governance Framework for Benin.

### Vision and requirements

The Information Governance aims to create a favorable and neutral system for reducing costs, pooling resources, improving management and ensuring compliance. Therefore, the country will be equipped with an efficient platform, which secures Agricultural Market Information everywhere and creates added value.

### **Structural Capability**

The Structural Capability includes structural (formal) elements in terms of roles, groups and mechanisms for connecting and enabling horizontal interactions between business and Information Management (Peterson 2004). Some details on the Structural Capability are provided in the table 1.

	/
Disciplines	Capabilities
Information policies	Availability of written desired behaviors to achieve business objectives
Information ownership	Availability of defined roles, responsibilities and business structures to support key
responsibilities	information management accountabilities, risks, deliverables and performance.
Information stewardship	Ability to ensure custodial care of data for asset enhancement, risk mitigation and
	controls

 Table 1:- Structural Capability of IG.

By analyzing the Beninese AMIS, the key players were identified and classified into categories of stakeholders based on their roles. In order to fill the IG gap, some new relevant roles were introduced according to the recommendations found in the literature. Sub-roles are defined in the complex cases.

Globally six main roles were addressed:

- 1. Information Trustee: the government body that holds all available information;
- 2. National Agricultural Market Information Leadership Group: represents an advisory body on all matters related to Agricultural Market Information;
- 3. Information Governance: set of instances involved in the governance of Agricultural Market Information;
- 4. Information Management: set of instances involved in the management of Agricultural Market Information;
- 5. Partners: informants, ICT or agribusiness services providers, public sector decision makers, technical and financial partners;
- 6. Beneficiaries: farmers, traders and others direct users of Agricultural Market Information.

The figure 3 presents the landscape of the proposed roles in different categories.



Figure 3:- Roleslayers for the AMI Governance.

Information governance and management involve the establishment of roles and responsibilities ensure accountability and effectiveness. The table 2 outlines the responsibilities and the stakeholders associated with the defined roles.

Table 2:- Re	sponsibilities	and stake	holders ass	ociated to	IG roles.
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Roles Responsibilities		Stakeholders		
Information Trustee	Holds and manages all available	Ministry of Agriculture		
	information			
National Agricultural	Establishes the Governance	Representatives of the departments of the		
Market Information	Committee and Team, provides	Ministry of Agriculture (MA), National		
Leadership Group	guidance regarding information	Information services and security agencies,		
	requirements	FPU-Benin		
Information Governance	Governs information through strategic	Specialists of the Departments of the Ministry		
Committee(COUNCIL)	direction, assigns the Governance	of Agriculture, line-of-business managers		
	Team roles	(FPU-Benin), lawyers		
Information Governance	Provides operationalGovernance	Specialists of the Departments of the Ministry		
Team (BOARD)through performance evaluation, risk		of Agriculture, Agricultural experts (FPU-		
	management and compliance	Benin), lawyers		
Information life-	Responsible for managing:	IT specialists (Departments of Information		
cycleManagement	information risks, information	System/Ministry of Agriculture), agricultural		
	analysis, information diffusion,	experts (FPU-Benin)		
	compliance.			
Data Management	Responsible for managing: data	Statistics specialists (Department of		
	quality, data analysis, data extraction	Agricultural Statistics/Ministry of		
		Agriculture), agricultural experts (FPU-Benin)		
Information technical	Manages all information assets using	IT specialists (Department of Information		
assets Management	relevant policies and mechanisms	Systems/Ministry of Agriculture)		

	including security processes.			
Financial assets	Mobilizes financial resource to	Agri line-of-business managers (FPU-Benin)		
Management	maintain the Information system			
Market analyst	Analyzes market information and	Statistics specialists (Department of		
	provides insight and recommendations	Agricultural Statistics/Ministry of		
	for further improvement	Agriculture), Agri line-of-business managers,		
	-	Farm management specialists (FPU-Benin)		
Records methodology	Defines the appropriate records	Statistic specialists (Department of		
manager	methodology to collect different data	Agricultural Statistics/Ministry of Agriculture)		
Records process	Captures and creates each type of	Front-line workers, technicians (FPU-Benin)		
manager	information			
Informant	Provides on-time information and	Farmers, traders, distributors, weather service		
	feedback	etc.		
Communication services	Responsible for information	Radio/TV channels, Printing press, mobile		
provider	dissemination in partnership with the	telephony operators,		
	Information Management			
IT services provider	Provides IT deployment support and	Internet providers, IT equipment suppliers, E-		
	information services	banking services		
Planner/	Uses market information as a decision	Public sector, Partners, NGOs		
Decision maker	support tool			
Beneficiary	Selects the best source of information	Farmers, traders, processors, others		
	to meet their requirements	agribusiness professionals		

### Procedural Capability

The table 3 outlines the required procedural capabilities related to the best practices for achieving the Governance objectives.

Table 3:- Procedural (	apability la	yer description.
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Practices	Capabilities		
Data Architecture	Architectural design of structured and unstructured data systems and policy-based		
	data protection		
Data classification/	Methods and tools used to create metadata that bridges human and computer		
MetaData	understanding, and to extract data		
Monitoring and audit Monitoring and evaluation of IG decisions implementation and			
	performance		
Data quality	Methods to measure, improve and certify the data quality		
Information lifecycle	Systemic approach to information design, acquisition, storage, diffusion, retention		
management	and deletion		
Security/Privacy/Compliance	Description of the degree to which IG decision-making follows specified rules and		
	standard procedures.		

#### **Relational capability**

The table 4 outlines the relational capabilities required to support the others capabilities layers.

Tuble 11 Relational Supromy algor description.			
Practices	Capabilities		
User education	Plan for capacity building through a center for competences and		
	excellence		
Integrative decision-making culture	Promotion of business colocation, integrative approach to solve		
	complex problems		
Information exchange	Business virtual connections and community interactions. Knowledge		
	sharing		

Table 4:- Relational Capability layer description.

### Implementation approach

The nextapproach based on height steps is proposed to implement the AMIGovFramework.

Steep 1. The Agricultural Ministry sets upthe Leadership group focusing on sense making interactions to guarantee the fulfillment of the IG vision.

Step 2. The Leadership Group chooses the members of the Governance Committee (strategic) to set the IG foundations.

Step 3. The Governance Committee proposes the Governance Team (operational), works on the Strategic Information Governance Plan and submits it to the appreciation of the Leadership Group.

Step 4. The Governance Team develops the Performance measurement, Risk management and Compliance Framework. This operational document must be validated by theGovernance Committee.

Step 5. The Management Teams are built by the key actors. Then, in interaction with the required partners, the Management Teamspropose Operational Management Plans that derive from the Strategic Governance document focusing on the deployment aspects. In practice, they may report periodically to the Governance Committee.

Step 6. Stakeholders, that support the agricultural development, produce the required business package in order to receive authorization (membership) for using the national AMIS resources to reach their targets.

Step 7. The Governance Team conducts continuous monitoring and audits to provide reports to the Governance Committee.

Step 8. The work of the Governance Committee andGovernance Team is periodically evaluated by the Leadership Group.

### **Discussions:-**

In the existingGovernance Model of the Harmonized Information System ofAgricultural Markets (H-ISAM), Information Governance and Information Management roles and functions are listed without the principle of differentiation.Functions of management, performance measurement, compliance and sustainability are assigned to the same actors. In such a context, it is difficult to achieve good performance. For example, if the team that ensures the risks management is not controlled by an external body, a high level of security will not be guaranteed. In practice, in the public sector of developing countries the same collaborators are committed to achieve several parallel tasks.Therefore, considering the important roles of some Departments of the Ministry of Agriculture in achieving the targeted objectives, governance teams are required to control the actions of operational teams.

TheInformation Governance based exclusively on the Governance of an Information System that uses a predefined businessmodel, may suffers from problems of generalization.

The proposedAgricultural Market Information Governance Framework (AMIGov) provides more outputs and tools than the IT or Information System Governance frameworks which focus on the technology and business, but does not study information as a differentiated asset. A comparative analysis of the similar models identified in the literature with the proposed AMIGov Frameworks is presented in table 5.

	IBM	Petersen	Talon et al.	Existing model	AMIGov
Governance Orientation	Information	Information	Information	Information	Information
		technology	technology	System	
Information	Yes	Yes	Yes	Yes	Yes
management roles					
Differentiated	Yes	Yes	Yes	No	Yes
governance and					
management functions					
Vertical interactions	Yes	Yes	Yes	Yes	Yes
Horizontal interactions	No <sup>(*)</sup>	Yes	Yes	Yes	Yes
as a fundament					

Table 5:- Comparative analysis.

<sup>(\*)</sup> The framework is design not for Market Information Governance with the involvement of the public sector, but for use in enterprise.

In the designed AMIGoV Framework, three governance roles are proposed: National Agricultural Market Information Leadership Group (Leadership Group), Information Governance Committee, and Information Governance Team. In fact, the Leadership Group already exists, since the different groups of actors have held several working sessions to propose the harmonized model. It is now a matter of institutionalizing this body, taking into account the procedural and relational capabilities by prioritizing horizontal interactions. On the other hand, the creation of Governance Committee and Team requires the recruitment of experts in addition to the professional skills available from the key actors. These experts must master international norms and standards to make recommendations for performance, compliance, capacity building and excellence.

Several advantages are linked to the differentiation of the roles of governance and management. The responsibilities are easily defined for the preparation of the various working documents. The performance and compliance criteria are specified in these documents and the operational teams can work on the basis of Service level Agreement with the governance bodies. On the basis of the existing model, main functions of governances and management are identified. Since a function can require some tasks from different key actors, for each function, an operationalization and monitoring document must be elaborated in accordance with the Strategic Governance plan. The fig.4 provides a representation based on the differentiation principle of the key governance and management functions for the main authors of the existing Harmonized Market Information System discussed in section 3.4.



Fig.4:- Synthesis of main functions of Agricultural Market Information Governance and Management

### **Conclusion:-**

In this work, an Agricultural Market Information Governance Framework (AMIGov) is introduced focusing on governance capabilities of Benin. This study recommends to shift from the existing Information System oriented Governance to the Information Governance to improve the use of market information and to ensure a higher level of satisfaction of all stakeholders. The required practices for each layer of the capabilityframework have been provided. The main governance and management functions and roles are described according to the principle of differentiation. This differentiation leads to the assessment of the information quality and the added value of the information disseminated to the beneficiaries at the system level and national level. A set of new governance roles is provided including a National Agricultural Market Information the creation of those roles should be guided by the principle of inclusive representation enabling horizontal interactions between key stakeholders (co-governance) and a capability approach. An agile methodology based on height steps is proposed to implement the designed Framework.

In perspectives, further research will be carried out for designing a holistic functions and roles(including subroles)Framework in alignment with the proposed Governance architecture for improving the Agricultural Market Information Governance in Benin.

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### **Conflicts of Interest**

The authors declare no conflicts of interest regarding the publication of this paper.

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