

Application of System Analysis and Information System Development of a Pilot Project GISColza

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Abstract— Within the framework of the reasoned diversification of cultures, the pilot project of relaunching of the Rape's sector (Relance de la Filière du Colza: RFC) has been defined. This innovative and partnership project adopted a quality approach encompassing in particular the definition of an information system. A cultural referential was adopted and a ministerial decree was published. A systemic methodological approach was adopted and a monitoring system for various activities of the project stakeholders was implemented. A structured analysis of these identified activities adopted a hierarchical approach using an informational logic. An innovative Research Action was retained by the IRESA and funding was granted. The results of both experienced Campaigns are summarily presented. Perspectives are finally suggested in the objective of ensuring the sustainability of the RFC project and be able to adapt to other cultures as well as farm management system.

Index Terms— Information System, Systemic Analysis, Agricultural Project.



1 INTRODUCTION

Within the framework of the incitation to reasoned diversification of cultures, an innovative approach to Relaunching of Rape's sector (RFC) has been defined and operated. The actors in this sector have combined both the private sector through industrial (Colza) and farmers as well as the public sector through the administration and structures of training and research. Civil Society has actively been involved through farmer's unions.

Expectations of RFC are improving grain yield through the techniques of crop rotation and diversification of oil production in Tunisia. The various attempts of Rape's production in Tunisia have often resulted in a temporary suspension for a recovery in the same conditions without any analysis of the experienced difficulties [1-2].

It is in this context that favorable objective conditions met to trigger this RFC adventure. Indeed, an industrial oilseed processor (Carthage Grain Company) requested farmers to reintroduce culture of Rape through their unions (Conect Agri, UTAP, Synagri) and the Ministry of Agriculture. A production contract between the industrial company and the producers was concluded. A ministerial decree was also published [3].

The actors in the RFC group comprise: professional structures of farmers; Structures of both ministerial support training and research; farmers; Carthage Grains that mobilized both its processor system and logistics support which could involve service providers (seeds, herbicides...).

The RFC pilot involved the feasibility of the project through a new systemic, participatory, innovative approach, equipped with a monitoring system from one hand and adopting the implementation of an information system from the other [4-9].

An agronomist engineer was recruited by the industrial partner. Rape fields Visits were carried out by dedicated committees composed of various skills from technical and regional structures (Regional Commissioner Agricultural Development CRDA, National Institute of Field Crops INGC, partners) and Human Resource competency. The cultural process of Rape (Fig.1) has adopted a cultural repository [10] which required the definition of an information system.

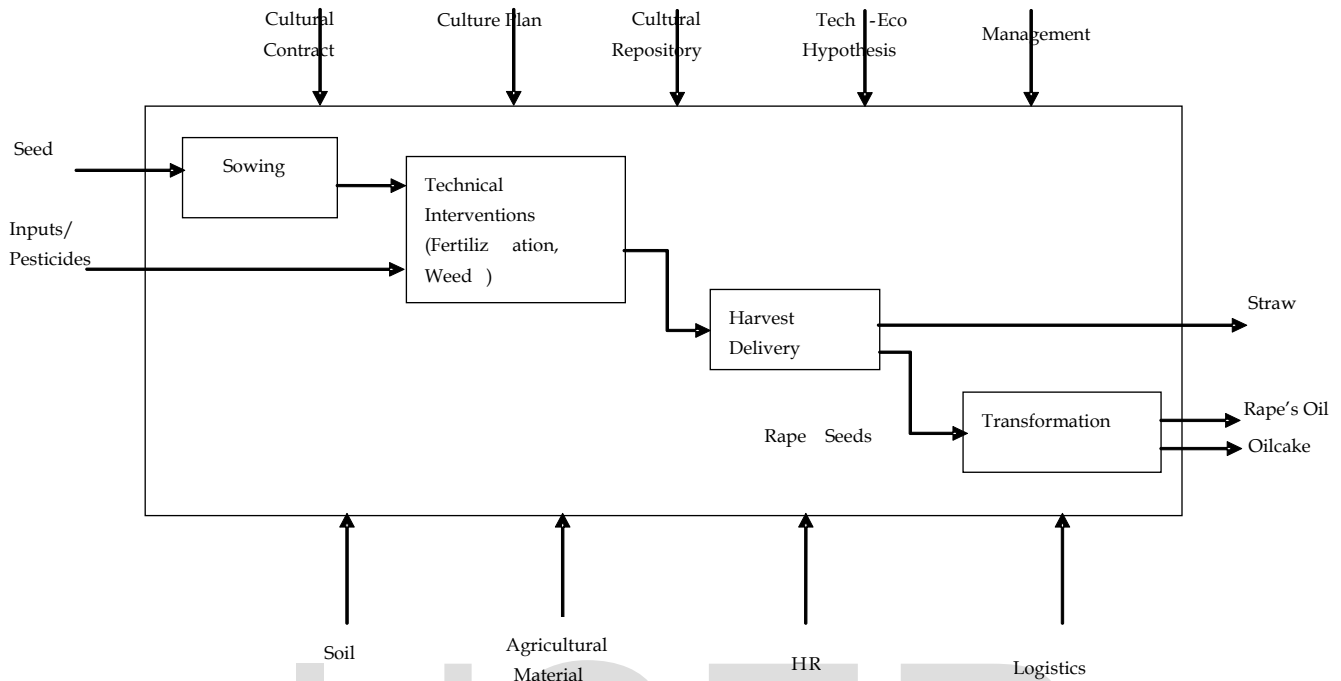


Fig. 1: Rape Cultural Process

The core information system exploited the Excel environment following a structured analysis of the various activities identified according to a hierarchical approach. Each hierarchical entity designated by Entity Activity (EA) is codified [11]. The main fields associated with EA are two fields of information (imported and produced by EA) and two fields tables (Tab) whether they are imported or produced by the EA. Thus only

through a matrix of EA (Fig.2), we can monitor the movement and the valorization of various information. A lexicon is built by all elements of the analysis of the system specification by specifying the hierarchical code of each item by category, and its mnemonic [12].

1	SIGClz	Spécification du Système d'Information SIGColza	Inf Importées	Inf Produites	Tab Imp	Tab Prod	Choix	Modèle
2	SIGClz1	Définir les utilitaires		Sup, Modf, Ajt, select, Dup, Imp, DragDrop, tri, filtr, Group				
3	SIGClz2	Déterminer la saison de culture de Colza		CdSais, DebSais, FinSais, PrxBas		TabBarem, TabStdCult		PUTr= PrxBas*(1-%Refac+ %Bonif)
36	SIGClz9	Définir la Culture de Colza						
37	SIGClz9.1	Déterminer les travaux préliminaires avant semis	CdParcClz, CdSais					
41	SIGClz9.2	Enregistrer la Pluviométrie (mm)	CdExpl, CdSais					
42	SIGClz9.3	Déterminer le Semis Colza	CdParcClz, CdPrdAch, DensPrdAch, SPareClz	DiDebSem, DiFinSem, DurSem, SEnsem, HJSem, CdOut, EcartLign, DosSem, ProfSem, DiDebRlg, DFinRlg, DurRlg, HJRlg, CtMazSem, CtMazRlg, CtMOSem, CtMORlg		TabOutSol	CdSemence	CdSemence = CdPrdAch,

Fig.2- EA Matrix of GISColza

2 Referential of RFC Pilot

2.1 Preliminary necessary elements of RFC Pilot

The preliminary necessary elements of RFC Pilot are:

- The cultivation contract between the producer and his client concerning the Grading Grid according to the seed quality of delivered Rape.
- The technical and economic assumptions used to determine certain direct logistics costs (fuel, labor, rental value).
- Identification of the farmer, the Agricultural Holdings, Manager and cultivated plots is declared.
- The acquisition of specific products for the production of Rape concerns seeds as well as pesticides.

2.2 Rape's Culture

The main activities of Rape's Culture are: Preliminary work before planting (soil analysis), the Rainfall, Culture of the previous season, equipments (tools, cost) - Sowing: variety seed, period, kind and adjusting the seeder, dose of seeds, rolling, labor - fertilization: fertilizer, fertilization method, dose, quantity, date, unit cost, total cost fertilization, labor - weeding: cultural stage, weed killer, dose, quantity weed killer, date, labor, weeding equipment -preliminary activities to harvest: appreciation of maturation and state weed- reference of Combine Harvester (CH), harvesting method - Harvest (bulk, bag): harvested parcel area, period, production of seeds, labor, production of Straw, storage of seeds, winnowing, threshing cost, efficiency - Control of Rape's culture is done by a dedicated committee under the cultural stage. This concerns making observations both general and specific and taking forward recommendations. During the visits, photos showing the cultural condition plots of Rape are recorded and physical measurements are performed to estimate certain useful data such as the areal density of shoots or certain weeds. At the end of the cycle, production of Rape's seeds is estimated in order to organize the collection and delivery to the pulper customer.

2.3 Delivery, seed analysis and cost of delivered Rape

Upon receipt of the production, samples were taken for laboratory analysis and a copy is given to the farmer. Various quality parameters are measured; the humidity and the total impurities content determine the price of the transaction according to the scale of grading and then the total cost is stopped. Other parameters affecting the crushing are measured: protein content, oil content, acidity of the extracted oil and specific weight.

Following the analysis of the sample taken and determining the corresponding tranche of the grading scale, a check is issued by the company to the producer who elaborates a farmer's worksheet covering the base price of Rape, the amount of the

seed's invoice, the delivered cost of Rape, and the amount of the paid check.

The transformation of Rape grains is based on an appropriate industrial process of crushing which can extract a share of oil for human consumption and also the Rape cake for animal consumption [13].

2.4 Innovative Research Project

An Innovative Research Project (ARI) was retained by IRESA (Institute of Agricultural Research and Higher Education) ; this is the project "Integrated and Federal Approach to Re-launching of Rape Oilseeds in Tunisia." This ARI is a comprehensive approach addressing the various components of the RFC. The human resources mobilized are the team members, students and researchers, engineers mobilized by Carthage Grains and a dedicated workforce. One of the targeted results of the ARI is to develop GISColza to manage the project RFC adopting a systemic approach by developing a project management model and testing the business model elaborated before the development and implementation phases, by operating usual software [14].

2.5 Results of experienced Campaigns

It considers these successive agricultural seasons 2014-2015 (S1) and 2015-2016 (S2). The Farmers were classified according to the attachment structures for S1 season (UCPA, INGC, Synagri, UTAP and CONECT AGRI) which has added a "New" category that joined during S2.

For S1, the Farmers were 66 at the start of the season to be only 37 at the harvest including 15 performers, 14 moderately performers and 8 non-performers. The abundants during the season were 29. The total harvested area is 462 ha. At the start of the season S2, 47 farmers have reported for 1526 ha spread over 6 Northern Governorates (Beja, Bizerte, Zaghuan, Manouba, Jendouba and Nabeul) [15].

3 METHODOLOGY ADOPTING THE METHOD MISDIP

In order to deal with complex situations involving different structures and mobilizing various resources, we need to adopt a global analysis approach [16-18]. A situation often has different components converging towards the achievement of an objective function.

The MISDIP (Integrated Method of Specification, Development and Implementation Project) drifts Project Planning methods characterized by hierarchical Activities Entities logic. These EA can be a target (global or specific), a result, an activity or its derivatives [19-21].

In fact, in the literature, we find many methods that have been used to enhance participation in Information System (IS) planning and requirements analysis. We cite some methods here for the reason that we think them to be reasonably representative of the general kinds of methods in use. The methods include Delphi, focus groups, multiple criteria decision-making (MCDM), total quality management (TQM), SADT (Structured Analysis Design Technique) and OOPP method (Objectives Oriented Project Planning) [22-24].

The OOPP method which is also referred to Logical Frame-

work Approach (LFA) is a structured meeting process. This approach is based on four essential steps: Problem Analysis, Objectives Analysis, Alternatives Analysis and Activities Planning. It seeks to identify the major current problems using cause-effect analysis and search for the best strategy to alleviate these identified problems (Fig.3).

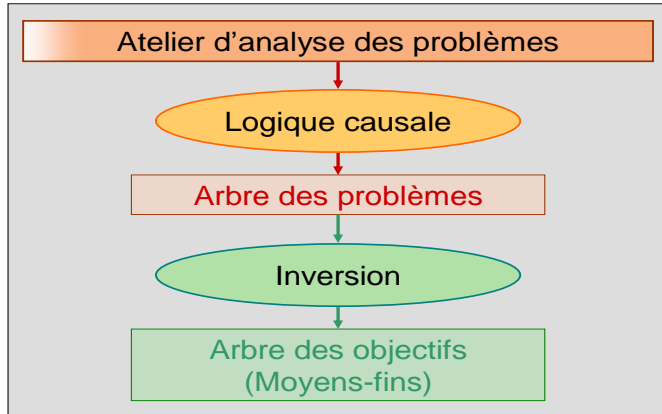


Fig.3- Objective tree of the OOPP method

Associating with each EA (What?) the responsibility parameters (Who?), The necessary resources for its execution: (How?), timing of completion (When?) and the location (Where?). In addition, documentary and quantitative indicators are defined. Among the resources, we have defined the informational resources associated with each EA by type (imported or produced information). The functionality of an information system lies in the sharing and circulation of such information [25-30].

4 SPECIFYING THE INFORMATION SYSTEM GISCOLZA

The architecture of the GISColza information system is defined by repository modules of RFC Pilot with added utility and functional modules (agricultural season, data relating to the farmer, to public and private partners). The MMI (Man-Machine Interface) is one of the central elements of GISColza. Fig.4 presents MMI of seasons.

Fig.4 MMI of Seasons

5 CONCLUSION

RFC Pilot operated during two successive seasons (not wet) with various partners can be considered a successful experience of the implementation and operation of an organization and management system that has the merit of being relatively operational. Productivity is estimated to be satisfied and its flow dynamic of Rape's producers is considered a carrier. However, various difficulties have altered the achievement of various objectives including particularly good governance, finance and subsidies system and the system of Research and Development.

We believe that following the results obtained during this first phase, that there is a need to initiate a second phase of sustainability where active operators effectively support autonomously. Indeed, each partner is called on to clarify his production, processing, valorization or financing commitments.

The centralized governance system during the first phase around the public authority (which has provided virtually no financial contribution and few rewarding measures of technical coaching, training or research) is to change the appearance around professional structures involving Civil society.

Furthermore the GISColza will be supported by a communication system encouraging actors to take charge.

We believe that the GISColza can be considered an adaptable model to various cultures and to be extended to the management of Agricultural Holdings: Information System for the Farm Management (GISEA).

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REFERENCES

- [1] Doligez F., Chouchane A., Halley D. and Mkacher A., Study concerted reformulation of Upgrade Program farms in Tunisia, MinAgr., AFD, December 2015.
- [2] Jebli I., Reintroduction of Rape in Tunisia: challenges and prospects. Projet de Fin d'Etudes, INAT, Tunisie, 2016.
- [3] Order No. 2481 of the Ministry of Agriculture dated on 11th November 2014 on the establishment of a joint commission to relaunch the project of Rape culture.
- [4] Lakhoua M.N., Systemic analysis of an industrial system: case study of a grain silo, Arabian Journal for Science and Engineering, Vol.38, 2013, pp.1243-1254.
- [5] Lakhoua M.N., Investigation on the application of systemic analysis of the cereals stock mobility process, International Journal of Applied Systemic Studies, Vol.4, N°4, 2012, pp. 227-238.
- [6] GTZ. ZOPP, an Introduction to the Method. Eschborn. Germany. 1988.
- [7] GTZ, Methods and Instruments for Project Planning and Implementation, Eschborn, Germany, 1991.
- [8] Gu P. and Zhang Y. 1994. OOPPS: an object-oriented process planning system, Computers & Industrial Engineering. Vol.26. Issue 4: 709-731.
- [9] Lakhoua M.N., Investigation on the application of systemic analysis of the cereals stock mobility process, International Journal of Applied Systemic Studies, Inderscience, Vol.4, N°4, 2012, pp. 227-238.
- [10] Annabi M., Plan Directeur de Stockage des Céréales, Atelier PIPO, Office des Céréales, Sidi Thabet, Tunisie, 2004.
- [11] Walter E.M. Introduction à la méthode de Planification des Projets par Objectifs. REFA. Maroc. 1998.
- [12] The Logical Framework Approach (LFA): Handbook for objectives-oriented planning, Norad, Fourth edition, 1999.
- [13] Annabi M. and Bel Hadj M.T., Partenariat Université-Entreprise dans le processus de mise à Niveau: Cas de l'Office des Céréales, Medelec 2004, Forum Scientifique, Sfax, Tunisie, 2004.
- [14] Lakhoua M.N., Investigation on the application of systemic analysis of the cereals stock mobility process, International Journal of Applied Systemic Studies, ISSN: 1751-0589, Inderscience, Vol.4, N°4, 2012, pp. 227-238.
- [15] Annabi M., Planification du projet de Recherche AIFRCOT, Atelier PIPO, INAT, Tunis, Tunisie, 2016.
- [16] General Administration of Cooperation to Development; Manual for the implementation of the Planning Interventions by Objectives (PIPO), 2nd Edition, Brussels, 1991.
- [17] Annabi M., PIPO étendue : Méthode Intégrée de Spécification, de Développement et d'Implémentation de Projet (MISDIP), International conference on Sciences and Techniques of Automatic control and computer engineering STA'2003, Sousse, 2003.
- [18] Ben Jouida T., Contribution to the implementation of strategic management of production by the analysis of workstations according to a systemic approach: Case study, PhD in Industrial Engineering, ENIT, 2008.
- [19] Lakhoua M.N., systemic analysis of a productive environment in order to implement an information system. Case study of a grain storage silo, PhD thesis, ENIT, Tunisia, 2008.
- [20] Lakhoua M.N. and Annabi M. State of the art of Strategic Planning, ICTTA'06. IEEE. Syria. Vol.1: 453-458. 2006.
- [21] Lakhoua M.N., Ben Jouida H., Using methods of system analysis and risk management of process systems, International Transactions on Systems Science and Applications, Vol. 8, December 2012.
- [22] Lakhoua M.N., Investigation in the cooperation of systemic methods: case study of an industrial process, Scientific Research and Essays, Vol. 6(7), pp. 1507-1513, 2011.
- [23] Lakhoua M.N., Systemic analysis of a supervisory control and data acquisition system, Journal of Electrical Engineering, vol.11, N°1, 2011.
- [24] Annabi M. and Bel Hadj M.T., Partenariat Université-Entreprise dans le processus de mise à Niveau: Cas de l'Office des Céréales, Medelec 2004, Forum Scientifique, Sfax, Tunisie, 2004.
- [25] Bouchoucha C., Chebbi S. and Annabi M., Strategy's studies on high voltage networks collapse, ACSE Journal, Vol.6, Issue (3), 2006.
- [26] Lakhoua M. N., Refining the objectives oriented project planning (OOPP) into method of informational analysis by objectives, International Journal of the Physical Sciences, Vol. 6(33), pp. 7550 - 7556, 2011.
- [27] Lakhoua M.N. and Ben Jouida T., Refining the OOPP into Method of Representation of the Information by Objectives, International Transactions on Systems Science and Applications, ISSN: 1751-1461, Vol. 7, No. 3/4, December 2011, pp. 295-303.
- [28] Killich S. and Fahrenkrug C., Intercompany Cooperations smaller and middle Businesses in the automobile-supply-industry, Düsseldorf 2002.
- [29] Killich S. and Luczak H., Support of Interorganizational Cooperation via TeamUp at Internet-Based Tool for Work Groups", Proceedings of the 6th internationally Scientific Conference, Berchtesgaden, May 22-25, Berlin, 2002.
- [30] Killich S., TeamUp, a software-technical support-tool, Businesses of the future, Aachen, 2002.