

Integral management model for agroecological organizations in Ecuador

Ximena Peralta Vallejo (Universidad of Cuenca -Ecuador-)

Gabriela Álava Atiencie (Universidad of Cuenca -Ecuador-)

Wilson Morquecho Vintimilla (Professional -Ecuador-)

I. Abstract

The agriculture has been suffering complex difficulties, as of green revolution. Several researchers consider that the solution for these problems is agroecology, which appeared in 1928. Different fields have developed notable contributions; even farmers have obtained political, social and technical support to confront green revolution. Nonetheless, investigations do not consider a business approach. Hence, it is necessary to determinate a proposal to manage agroecology agriculture business. In order to define an appropriate model, this investigation reviews the evolution of agroecology around the world, its development in regions of Latin America as Brazil, Andean Region and Centre America. In addition, it is analyzed the agroecology path in Ecuador.

Later, it is explained the necessity of a proposal under a business management approach. The proposed model considers Process Management, Value Based Management and Balanced Scorecard criteria. It is a mixed management tool that will provide support to farmers, as well as to all stakeholders in agriculture, food sovereignty and agroecological sustainability.

Keywords: agroecology, management model, process.

II. Agroecology: origin and evolution

The beginning of agroecology was in 1928. A Russian agronomist named Bensin published a book describing ecological methods on commercial crop plants (Wezel & Soldat, 2009). At the beginning, agroecology was derived from two main disciplines: agronomy and ecology. Although, other fields as zoology and botany – plant physiology also contributed (Wezel et al., 2009).

Since 1930 to 1970, several contributions were made. In 1930, Friederichs published one book related with pest management and its economic impact, this book did not use agroecology (Friederichs, 1930). A German ecologist and zoologist called Tischler (1965) published important articles using the term agroecology between 1950 and 1961, his research addressed pest management, soil biology, insect biocoenosis and plant protection. On the other hand, Kagles (1942) who was agronomist, published his book Ecological crop geography in 1942.

In the year 1970 (Wezel & Soldat, 2009) agroecology was defined as a scientific discipline (Plot,/field approach, ecology of food system and agroecosystem ecology) in response to green revolution. By the year 1980, agroecology emerged as set of practices (techniques) (Arguello, 2016), studying agroecosystems, in order to protect natural resources. It was not until 1990 when agroecology was conceived as a movement (environmentalism,

sustainable agriculture and rural development). It became a new expression to describe how agriculture relates with society (Wezel et al., 2009). Agroecology helped to improve farmers practices, who used a high in-puts of chemical into agriculture, stimulated by international corporations (Gliessman et al., 1998).

From the 2000's, some authors considered to change agroecosystem for food systems. Agroecology was related with sustainability, sustainable agriculture and sustainable development. It increased the investigations connecting agroecology with agrobiodiversity and biodiversity conservation. Eventually agroecology was associated with organic farming/agriculture (Wezel & Soldat, 2009). After a brief introduction about agroecology evolution through the years, it is necessary to review the changes and improvements generated in the Latin American context.

III. Emergence of agroecology in Latin America

The green revolution began in 1944 (Ameen et al., 2017), because of Rockefeller Foundation created an institute to improve agricultural production in Mexico. However, in the last 1970's and early 1980's (Altieri, Miguel A, Nicholls, 2017) agroecology emerged against the negative impacts of green revolution (20th century). As Toledo (2012) explains, it had important innovations in dissimilar regions.

3.1 Brazil

The innovation started in 1980 with two key authors: J. Lutzenberger (philosophic vision) and M. Primaves (agroecosystem health based on the ground). The following decades, new agroecologist generations were created. It was a reorientation of rural families into agroecology postulates. International congresses (from 2001 to 2009) and Agroecology Meetings (it started in 2001). In 2002 was created the "Articulação Nacional de Agroecologia-ANA" (2020). Moreover, other important organizations had social and political impact, such as: "Confederação Nacional dos Trabalhadores na Agricultura-CONTAG", and the "*Movimiento de Trabajadores Sin Tierra-MTST*". Distinct public policies have supported familiar agriculture, communication programs, creation of organic markets and training for rural sectors.

3.2 Andean region

The farmers had influence and presence in public politics. Especially in Peru, Ecuador and Bolivia. They were organized protests in Ecuador, years 1990 (El Universo, 2019) and 1994 (Guerrero, 1997), against the agrarian distribution and commercialization of lands. The indigenous movement from Ecuador, Peru and Bolivia contains neoliberal policies. These movements are rural, decentralized and autonomous have organized networks, influencing rural movements. However, their main Contribution is how they combine Andean agriculture with agroecology against industrialization.

This Andean agriculture provides strategies in contradiction of scarce and irregular rains, unfavourable topography, poor soils and extreme temperatures (Altieril & Yurjevik, 1991). From the 2000's, committed researchers, technicians and professionals promoted Social Economy, seeking for a sustainable society.

3.3 Central America

In 1987 emerged a network among farmers, Non-Governmental Organizations - NGO's and researchers. Several Mayan extensionists visited farmers located in Tlaxcala. Later, Nicaraguan farmers arrived and learned how to preserve water and soil. This knowledge was introduced in the "Unión Nacional de Agricultores y Ganaderos-ANAG" (Altieril & Yurjevik, 1991) . It was controlled by the government, medium and large landowners. It helped to diffuse the agroecological methods and principles. In Mexico, the agroecology surged towards the end of 1970. This country had an adequate management of natural resources (including forests and agrobiodiversity conservation). Forest communities learned a correct production of timber and non-timber products. Mexico also has a relevant participation in coffee production (around 70% produced by rural communities). Farmers apply polyculture and agroforestry systems in coffee production (Toledo, 2012).

In 1989, commercial relationships between Cuba and Socialist bloc were broken. It started an energetic, economic and food deficit. The government, society and Scientifics related with agroecology responded it. The energetic crisis generated the need of renewal energies (hydroelectric, Aeolian, solar and sugarcane). The government also created artisanal manufacturing of bio-pesticides and fertilizers. They also covered undergrowth with straw (avoiding herbicides use) and controlled the soil erosion through contour planting/farming. The bagasse was reused as food for cattle, fuel for mills and fertilizer to improve the soil (Funes & Vázquez, 2018) . Therefore, Cuba has contributed for organic agriculture considering agroecology as a guide. In its Capital – Habana was introduced urban gardens, in order to fight the lack of food. Finally, the "*Movimiento de campesino a campesino*" – ANAP, has been helping to transmit knowledge, practices (traditional practices), low implementation of external in – puts, and ecological techniques developed by Cuban scientists among farmers (Machín, 2017).

IV. Agroecology in Ecuador

In Ecuador agroecology started from the eighties to mid-nineties (Heifer Ecuador, 2014a); Non-Governmental Organizations and social actors emerged, consequently, new peasant organizations created important networks. Table 1 explains how some of these organizations contributed to develop agroecology in Ecuador (Gortaire, 2017).

However, one remarkable event happened. It was the first National meeting of Agroecology, which lasted from October 27 to 29, 2005 (BioDiversidad, 2005). Later in 2008 (Colectivo Agroecológico, 2020) was created the "*Colectivo Agroecológico*", it is considered the most important social reference and mean for all the agroecology NGO's, political advocacy, awareness campaigns, moreover, politic and academic events.

On the other hand, Heifer Ecuador created the National School of Agroecology – ENA. This project is oriented to work with rural, indigenous, Afro communities, mangrove peoples and fishers organizations (Heifer Ecuador, 2014b). In addition, its goal is to educate the mentioned groups, in order to socialite the topics of agroecology and food sovereignty.

Year	Organization	Contribution
1980	“Fundación Brethen Unida” – FBU	Promotion of Biologic agriculture
	“Desarrollo Juvenil Comunitario”, “Cabildo Mayor de Cusubamba”	Implementation of organic techniques in short cycle production and home gardens
1982	Swissaid	Supporting indigenous peasant agriculture with agroecological orientation
1986	Swissaid	First meeting of organic farmers from Chimborazo, Bolívar, Tungurahua, Cotopaxi and Pichincha
	Centro de Tecnología Popular – CETEP	Agriculture rescue and revaluation in ancient settlements
1987	“Grupo Solidaridad”	It creates in Riobamba the first community basket.
1989	“Asociación de Productores Biológicos del Ecuador” – PROBIO	Application of European organic agriculture
1990	“Coordinadora Ecuatoriana Agroecológica” – CEA	It was founded to support the articulation and expression of agroecology organizations
1993	“Programa Nacional de Desarrollo Rural” – PRONADER	Intervention to generate agroecology strategies in Cotopaxi, Carchi, Chimborazo, Bolívar, Manabí y Guayas
	“Agrovida”	Offer free agrochemical products in Cuenca (Azuay)
	“Centro de Investigaciones Sociales de Loja” – CISOL	Promotion of organic agriculture, in order to reduce the use of pesticides
2000	Community Basket UTOPIA	In Riobamba, agroecologist producers and consumers associate themselves

Table 1. Non-Governmental Organization and social actor. **Source:** <https://doi.org/10.26807/ant.v0i17.85>

The agroecology has legal support in Ecuador. The Constitution of Ecuador, article 281 indicates that the Government will promote food sovereignty for people, communities and towns (Asamblea Nacional del Ecuador, 2019). Subsequently, it was approved the “*Ley Orgánica de Régimen de Soberanía Alimentaria*”, in 2009. The State establishes mechanisms to guarantee healthy, nutritious and culturally appropriate food to individuals, communities and towns, permanently (Asamblea Nacional del Ecuador, 2017b).

Finally in 2017 was approved “*Ley Orgánica de Agrobiodiversidad, Semillas y Fomento de Agricultura*” (Asamblea Nacional del Ecuador, 2017a), the articles 6, 14 and 48 mention agroecology as a strategy, State obligations and sustainable agriculture, respectively. Agroecology has adopted a high relevance; thus, it needs a guide to manage its results and look for improvement. The next section explains why it is indispensable a management model for the Ecuadorian context.

V. Why is necessary to propose a management model?

Since agroecology was coined in 1930, it had evolution in different fields. Consequently, there are dissimilar definitions. Altieri defines it: “Agroecology is both a science and a set of practices. As a science, agroecology consists of the application of ecological science to the study, design and management of sustainable agroecosystems” (Altieri & Toledo, 2011, p.588). On the other hand, Ecuadorian Agroecology Coordinating-CEA office stated:

Agroecology is a new concept based on an old way of relating with Nature and her products, recovering the protagonist’s role of human beings, farmers, families and communities. It is an approach dynamically tapping ancestral knowledge and favouring participatory research to manage agroecosystems efficiently and sustainably and generating a philosophy for harmonious coexistence with Nature. It is the only way to achieve food sovereignty by public control over food production, distribution and consumption. Agroecology questions the market thinking of capitalist economics and its consumerist approach and destruction of Nature; and its thought and action are committed to building alternatives for the life and development of peoples and society at large. (Heifer Ecuador, 2014b, p.28)

These definitions and others lead the investigations all over the world to focus on technical improvements, agroecosystems, knowledge transferring, politic governance, farming processes, etc. Nevertheless, there are no proposals for agroecology administration under a business management approach. Hence, the next subsections explain the bases to define a flexible and easy understanding proposal for the province of Azuay in Ecuador.

5.1 Agroecology sustainability

A management model needs to have solid bases, applicability and easy understanding for peasant people, because they will use it. With this on mind, the bases for the model are proposed by Gabriela Alava (2019), who defined three sub – dimensions to analyse agroecology sustainability (Figure 1) considering two indispensable aspects: Alimentary Sovereignty¹, and, Solidarity and Popular Economy².

Meanwhile, Altieri and Nicholls (2009) also consider that agroecology contributes with energy sovereignty, technological sovereignty and food sovereignty in a resilience context. Both authors consider agroecology the best response to social problems, such as food crisis, peasant economy and global pollution. A suitable management model is the start to measure, control and evaluate all these features.

¹ The right of people, communities, and countries to define their own agricultural, labor, fishing, food, and land policies in ways that are ecologically, socially, economically, and culturally appropriate to their unique circumstances (Ortega-cerdà & Rivera-ferre, 2010).

² Popular and Solidarity Economy is understood as the form of economic organization. Where its members, individually or collectively, organize and develop production and exchange processes, commercialization, financing and consumption of goods and services, to satisfy needs and generate income, based on relationships of solidarity, cooperation and reciprocity, privileging work and the human being as the subject and end of its activity, oriented to good living, in harmony with nature, above appropriation, profit and accumulation of capitals (Asamblea Nacional del Ecuador, 2018).

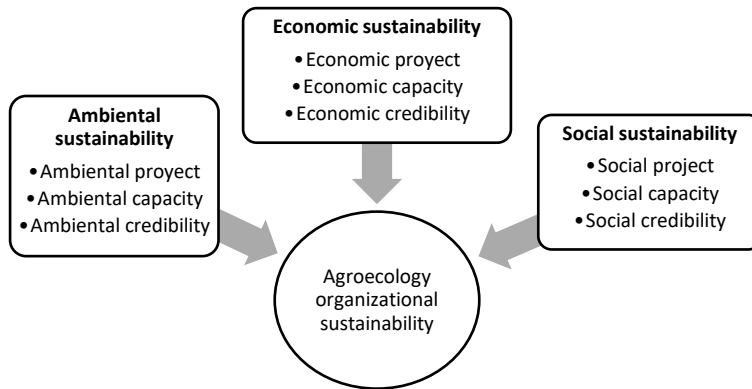


Figure 1. Sub – dimensions to analyse agroecology sustainability. **Source:** <https://core.ac.uk/download/pdf/287737047.pdf>.

5.2 Which management tools are considered?

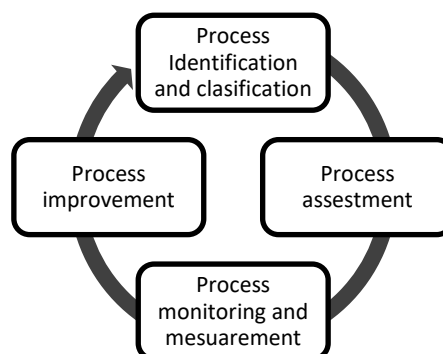
It is presented different but compatible tools.

5.2.1 Process Management

A process is defined as: “set of interrelated or interacting activities that use inputs to deliver an intended result” (International Organization of Standardization, 2015, p. 1), the outputs contains an added valued. It is important to remark that all the processes operate as a system and apply PDCA³ philosophy, which seeks for continual improvement. There are three sorts of processes:

- a) **Strategic:** It is in charge of the management system.
- b) **Operational:** It transforms customer requirements (internal or external) into a product.
- c) **Support:** It gives management support, without intervening in the product elaboration directly.

Figure 2 describes the methodology to apply this tool. This implementation can provide a good start for farmers into management vision, which is indispensable to generate a positive profit margin.



³ P:Plan, D:Do, C:Check and A:Act.

Figure 2. Process management implementation. **Source:** <https://www.iso.org/files/live/sites/isoorg/files/archive/pdf/en/iso9001-2015-process-appr.pdf>

5.2.2 Value Based Management

This concept appeared in the nineties. However, value has dissimilar interpretations and procedures to calculate it. A management approach has a financial control, strategic mentality and human talent management. This complements the process methodology and regulates the strategic, tactical and operational levels (Calvo & López, 1999). The objective is to measure how much value is added for the shareholders, clients, employees and society with the best use of available resources (capital).

Nonetheless, considering an agroecological context the families are shareholders, employees and clients (family self-consumption) at the same time, although they also have external customers and provide benefit for society. Moreover, they don't apply accounting or financial analysis. With this in mind, it is indispensable to select simple but accurate accounting model, in order to select useful indicators and measure the added value for women and men peasants.

5.2.3 Balance Scorecard

Kaplan y Norton developed a management tool in 1992 to study "performance measurement in companies whose intangible assets played a central role in value creation" (Kaplan, 2010, p. 3). Nevertheless, this tool has been applied in private, public and non-profit organizations, obtaining great results. It considers four perspectives:

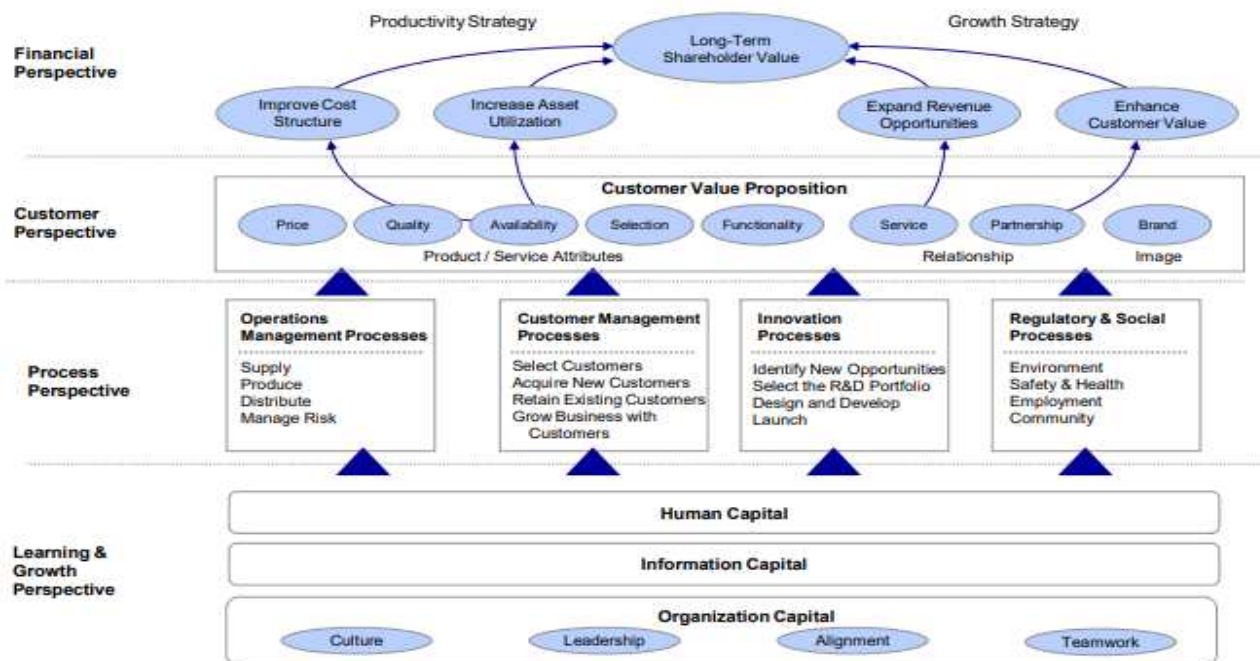


Figure 3. Strategic Map (Balance Scorecard perspectives). **Source:** [https://www.academia.edu/31509283/Conceptual Foundations of the Balanced Scorecard](https://www.academia.edu/31509283/Conceptual_Foundations_of_the_Balanced_Scorecard)

- a) **Financial:** It creates value for shareholders.
- b) **Client or customer:** It seeks to satisfy the client considering: quality, price, relations and value perception.
- c) **Processes:** It controls the internal key processes.
- d) **Learning and growth:** It measures human capital, information capital and organization capital performance.

The four perspectives are related as Figure 3 shows. These relations describe how an organization can achieve its vision, applying strategies correctly. The last tool is compatible with Process Management and Value Based Management. However, as it was mentioned before it is necessary to consider the farmers context, thus, the proposal model adopts flexibility and applicability.

5.3 Azuay-Context

The proposal model considers the context in 2016, province of Azuay. It has 824,646 (Instituto Nacional de Estadísticas y Censos-INEC, 2012) people of which 37% people (305,119) live in rural area. Azuay has 630 (Instituto Nacional de Estadísticas y Censos-INEC, 2017) companies by 10,000 people, it represents 32,730 companies in urban zone and 19,222 companies in rural zone.

The sector of Agriculture, livestock, forestry and fishing in Azuay represents 5.33% of companies (2,769). In Azuay 150 (Alava, 2019) companies consider themselves agroecological, representing 5.42%. These companies are located in 93.33% of the cantons (14 out of 15). Figure 3 shows the number of companies for each canton. The data indicates a presence of agroecology in almost all the province. Therefore, considering the mentioned management tools and the context of Azuay, the proposal needs to follow a correct methodology explained below.

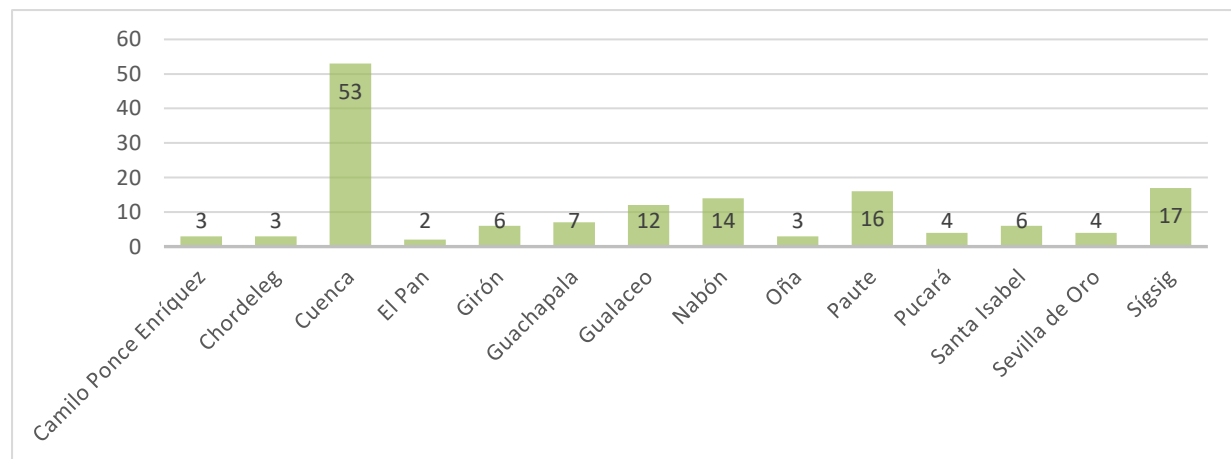


Figure 4. Number of agroecology companies in Azuay. **Source:** <https://core.ac.uk/download/pdf/287737047.pdf>

VI. Integral Agroecology management proposal model

6.1 Key processes: Strategic, operational and support

Processes are the base of the proposal model. For a correct functioning (Figure 4), there are two strategic processes: Strategic direction and continual improvement, they define mission, vision, values and strategic goals, in order to achieve quality for the client.

The operational processes are production and commercial storage, and product sales. They produce agroecological food and sell it, satisfying the client needs. Whilst, support processes are three. Technical support and purchasing contribute with employee training, input supply and services contracting. Moreover, accounting keeps a financial record. The key processes are associated with Valued Based management. However, it was mentioned the need of proposing an accounting model, it is presented below.

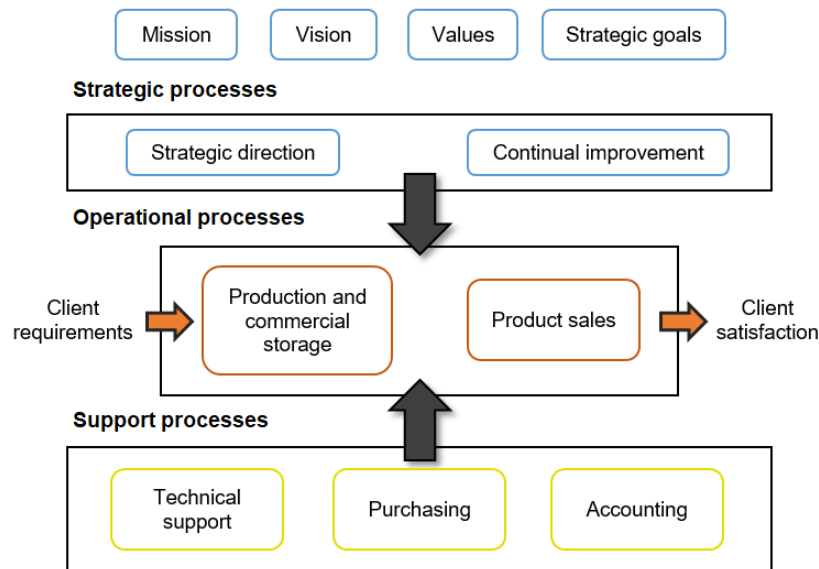


Figure 5. Number of agroecology companies in Azuay. **Source:** Own elaboration.

6.2 Accounting model

Accounting is a perfect tool to calculate financial indicators, with the objective of determining profitability. For this proposal management model, it is required a daybook, trial balance, balance sheet, bank reconciliation, tax reconciliation and income statement. The financial information will provide the incomes for stablishing indicators (Table 2).

<i>Indicator</i>	<i>Formula</i>
Current ratio	Current Assets / Current Liabilities
Financial solvency	Total Assets / Total Liabilities
Return On Assets – ROA	Net income / Total Assets
Return On Equity – ROE	Net income / Shareholders' Equity
Debt Ratio	Total Liability / Total Assets

Table 2. Financial indicators. **Source:** Own elaboration.

It is important to measure and analyse the current liquidity (current ratio), long-term ability to pay (financial solvency). How effectively the company is earning a return on its investments in Assets (ROA). In addition. If the company is generating profit without shareholders' Equity (ROE) and how much debt it can have (Debt Ratio). There are more

financial indicators. However, the proposal management model looks for simplicity. The next sub – section presents a Balance Scorecard, it will provide a control over the processes, which include the presented accounting.

6.3 Control and continuing improvement: Balance Scorecard

Perspective	Indicator	Description	Unit of measurement	Frequency	Formula	Responsible
Financial perspective	Current Ratio	Capacity of the company to generate cash and cover its short-term debt	Number	Monthly	$\frac{\text{Current Assets}}{\text{Current Liabilities}}$	Manager
	Solvency	Ability of the company to meet all its debt	Number	Monthly	$\frac{\text{Total Assets}}{\text{Total Liabilities}}$	Manager
	Return On Assets – ROA	It allows to determine the profit generated by each dollar invested	Number	Monthly	$\frac{\text{Net income}}{\text{Total Assets}}$	Manager
	Return On Equity – ROE	It allows to determine the profitability of the contributions made by shareholders	Number	Monthly	$\frac{\text{Net income}}{\text{Shareholders' Equity}}$	Manager
	Debt Ratio	It measures the level of investment in assets that have been financed by third parties	Number	Monthly	$\frac{\text{Total Liability}}{\text{Total Assets}}$	Manager
Client perspective	Client satisfaction	It allows to analyse client satisfaction	Percentage	Weekly	$\frac{\text{Satisfied client}}{\text{Total clients}}$	Manager
Processes perspective	Process evaluation	It indicates if the administration is concerned in the management of the quality cycle	Percentage	Six-monthly	$\frac{\text{Processes under improvement}}{\text{Total processes}}$	President
	Achievement of goals	It allows to know the contribution generated by the human talent for the achievement of goals	Percentage	Six-monthly	$\frac{\text{Achieved goals}}{\text{set goals}}$	Process owner
	Variation in sales	It determines the evolution of income	Percentage	Quarterly	$\frac{((\text{Sales revenue} - \text{previous quarter sales revenue}) / \text{previous quarter sales revenue}) \times 100}{}$	Manager
	Improvement actions	It determines the evaluation compliance to the management system and its corresponding improvement	Percentage	Monthly	$\frac{\text{No. of corrective actions implemented}}{\text{No. of proposed corrective actions}}$	President
Learning and growth perspective	Recruitment and hiring	It determines if the human talent of the entity met with the requirements defined for its position	Percentage	Six-monthly	$\frac{\text{No. of met requirements by the employee}}{\text{Total requirements of the position}}$	President
	Education and training	It indicates the percentage of updating knowledge of managers and collaborators	Percentage	Six-monthly	$\frac{\text{No. of effective training hours}}{\text{No. of training hours proposed}}$	Manager
	Purchase order compliance	It identifies whether suppliers comply with deliveries according to given specifications	Percentage	Quarterly	$\frac{\text{Compliant orders with quality}}{\text{Total orders requested}}$	Manager

Table 3. Proposed Balance Scorecard. **Source:** Own elaboration.

The proposed Balance Scorecard (Figure 4) lacks of two more columns, which would be goal and control. These two criteria have to be defined by all the organization, when the strategic plan is stabilised. The four perspectives control the Process Management and Value Based Management, obtaining an integral mixed proposal.

VII. Conclusion

This proposal mixes three models in a simple and flexible way, it connects one of the most important facts of agroecology, which is, know – how with management tools. It will provide an effective management tool for peasant people. They will be able to elaborate a strategic plan (set goals), analyse their financial situation (financial perspective), improve their production and selling process, in order to achieve quality for the customer (client perspective), seek for continual improvement knowing their strengths and weaknesses (processes perspective) and improve the human talent (learning and growth perspective).

However, the next step is the implementation of the Integral Management agroecology Model in Azuay, in order to verify its applicability. The applying process will demand a training stage for peasant people, monitoring and correction of deviations.

VIII. References

- Alava, G. (2019). *Sostenibilidad de organizaciones agroecológicas que apoyan al fomento de la economía popular y solidaria en la provincia del Azuay*. UNIVERSIDAD COMPLUTENSE DE MADRID.
- Altieri, Miguel A, Nicholls, C. I. (2017). Agroecology : a brief account of its origins and currents of thought in Latin America. *Agroecology and Sustainable Food Systems*, 41(3–4), 231–237. <https://doi.org/10.1080/21683565.2017.1287147>
- Altieri, M., & Nicholls, C. (2009). Agroecology Scaling Up for Food Sovereignty. *Monthly Review*, 6, 1–29. <https://doi.org/10.1007/978-94-007-5449-2>
- Altieri, M., & Toledo, V. (2011). The agroecological revolution in Latin America: rescuing nature, ensuring food sovereignty and empowering peasants. *Journal of Peasant Studies*, 38, 587–612. <https://doi.org/10.1080/03066150.2011.582947>
- Altieril, M. A., & Yurjevik, A. (1991). La agroecología y el desarrollo rural, sostenible en America Latina. In *Agroecología y Desarrollo* (Vol. 1).
- Ameen, A., Raza, S., & Ameen, M. A. (2017). Green Revolution : A Review. *International Journal of Advances in Scientific Research*, 03(12), 129–137.
- Arguello, H. (2016). Agroecology : Scientific and technological challenges for agriculture in the 21st century in Latin America Agroecology : scientific and technological challenges for agriculture in the 21 st century in Latin America Agroecología : retos científicos y tecno. *Agronomía Colombiana*, 33(3), 391–398. <https://doi.org/10.15446/agron.colomb.v33n3.52416>
- Articulação Nacional de Agroecologia. (2020). *Articulação Nacional de Agroecologia*. O Que é a ANA.
- Asamblea Nacional del Ecuador. (2017a). *Ley Orgánica de Agrobiodiversidad, Semillas y Fomento de Agricultura* (pp. 1–22).
- Asamblea Nacional del Ecuador. (2017b). *Ley Orgánica Régimen Soberanía Alimentaria* (p. 15).
- Asamblea Nacional del Ecuador. (2018). *Ley Orgánica de la Economía Popular y Solidaria y del Sector Financiero Popular y Solidario* (p. 65).
- Asamblea Nacional del Ecuador. (2019). *Constitucion de la República del Ecuador* (p. 182).

- BioDiversidad. (2005). *Ecuador: Primer Encuentro Nacional de Agroecología*.
- Calvo, A., & López, C. (1999). Reflexiones sobre la “gestión basada en el valor” orientadas al desarrollo de un proyecto de investigación. *La Gestión de la Diversidad : XIII Congreso Nacional, IX Congreso Hispano-Francés, Logroño (La Rioja), 16, 17 y 18 de Junio, 1999, 2*, 43–50.
- Colectivo Agroecológico. (2020). *Colectivo Agroecológico*. Quienes Somos.
- El Universo. (2019). *La pobreza, el tema recurrente en la protesta indígena en Ecuador desde 1990*. La Pobreza, El tema recurrente en la protesta indígena en Ecuador Desde 1990.
- Friederichs, K. (1930). Die Grundfragen und Gesetzmäßigkeiten der landund forstwirtschaftlichen Zoologie. *Paul Parey, 1*, 417–443.
- Funes, F., & Vázquez, L. (2018). Avances de la agroecología en Cuba-Libro. *Congreso Latinoamericano de Agroecología*, 1–6.
- Gliessman, S., Engles, E., & Krieger, R. (1998). *Agroecology: Ecological Processes in Sustainable Agriculture*. CRC Press.
- Gortaire, R. (2017). Agroecología en el Ecuador. Proceso histórico, logros, y desafíos. *Antropología Cuadernos de Investigación, 12*, 12–38.
- Guerrero, A. (1997). *El levantamiento indígena de 1994: Discurso y representación política (Ecuador)*. *19*, 65–90.
- Heifer Ecuador. (2014a). *La agroecología está presente. Mapeo de productores agroecológicos y del estado de la agroecología en la sierra y costa ecuatoriana*.
- Heifer Ecuador. (2014b). *The experience of the National Agroecology School Translated by*.
- Instituto Nacional de Estadísticas y Censos - INEC. (2012). *Proyecciones poblacionales*. Presentación de Principales Resultados.
- Instituto Nacional de Estadísticas y Censos - INEC. (2017). *Directorio de empresas y establecimientos 2016*. Presentación de Principales Resultados.
- International Organization of Standardization. (2015). *The Process Approach in ISO 9001 : 2015* (p. 7).
- Kaplan, R. S. (2010). Conceptual Foundations of the Balanced Scorecard. In *Harvard business school*.
- Klages, K. H. . (1942). *Ecological crop geography* (Macmillan).
- Machín, B. (2017). El movimiento agroecológico de campesino a campesino en sus 20 años de implementación en Cuba. *Agroecología, 12*(1), 99–105.
- Ortega-cerdà, M., & Rivera-ferre, M. G. (2010). Indicadores internacionales de Soberanía Alimentaria . Nuevas herramientas para una nueva agricultura. *Revista Iberoamericana de Economía Ecológica, 14*, 53–77.
- Tischler, W. (1965). *Agrarökologie*. Gustav Fischer Verlag.
- Toledo, V. M. (2012). *La agroecología en latinoamerica: tres revoluciones, una misma transformacion*. 37–46.
- Wezel, A., Francis, C. A., & Vallod, D. (2009). *Agroecology as a Science , a Movement and a Practice Review article*. Agronomy for Sustainable Development. <https://doi.org/10.1007/978-94-007-0394-0>
- Wezel, A., & Soldat, V. (2009). A quantitative and qualitative historical analysis of the scientific discipline of agroecology. *International Journal of Agricultural Sustainability, 7*(1), 3–18. <https://doi.org/10.3763/ijas.2009.0400>