DOI: 10.13140/RG.2.1.2756.3761
http://dx.doi.org/10.13140/RG.2.1.2756.3761
Cultivos Tropicales, 2016, vol. 37, no. 3, pp. 15-21 July-September

ISSN print: 0258-5936
ISSN online: 1819-4087

Ministry of Higher Education. Cuba
National Institute of Agricultural Sciences
http://ediciones.inca.edu.cu

USE AND HANDLING OF AGROECOLOGICAL PRACTICES IN FARMS OF SAN ANDRÉS LOCALITY, LA PALMA MUNICIPALITY

Uso y manejo de prácticas agroecológicas en fincas de la localidad de san andrés, municipio La Palma

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ABSTRACT. The research was conducted at the farms the municipality of La Palma, Pinar del Río province, during the years 2012/2013 with the objective to evaluate the use and management of agro-ecological farms from the San Andrés community. The study methodology was based on the basic principles of agroecology and designed from participatory planning in the implementation of development strategies, including the integration of diagnostic methods used to achieve the objectives. Stages started with the identification and characterization of agroecological practices commonly used in the agricultural sector of the community, in addition to performing diagnosis for the limitations and potential of the farms in the use and management were implemented agroecological practices, for characterization and prioritization of problems the SWOT matrix which allowed determining the strategy for achieving the objectives was used. This involved enhancing the strengths possessed farms in implementing ecological practices to take advantage of opportunities that could be affected by the environment, in addition to an analysis of the current situation was designed participatory development strategy for better use and management of agro-ecological practices in the community under study. In this context besides to formulate the strategy, the of full integration of the territory organizations supporting farmers and have strengthened the production system was achieved with agroecological approaches.

Key words: agroecology, participation, diagnostic, development strategy

RESUMEN. La investigación se realizó en fincas del municipio La Palma provincia Pinar del Río, durante los años 2012/2013 con el objetivo de evaluar el uso y manejo de prácticas agroecológicas en fincas agropecuarias de la comunidad de San Andrés. La metodología de estudio se fundamentó en los principios básicos de la agroecología y se diseñó a partir de la planificación participativa en la ejecución de estrategias de desarrollo, además de la integración de métodos de diagnóstico utilizado para lograr los objetivos propuestos. Se ejecutaron etapas que comenzaron con la identificación y caracterización de las prácticas agroecológicas más utilizadas en el sector agropecuario de la comunidad, además de la ejecución del diagnóstico para conocer las limitantes y potencialidades de las fincas en el uso y manejo de las prácticas agroecológicas. Para la caracterización y jerarquización de los problemas se utilizó la matriz DAFO lo que permitió determinar la estrategia a seguir para lograr los objetivos propuestos, además de realizar un análisis de la situación actual se diseñó de forma participativa una estrategia de desarrollo para un mejor uso y manejo de prácticas agroecológicas en la comunidad objeto de estudio. Esto implicó la potenciación de las fortalezas que poseían las fincas en la aplicación de estas prácticas para poder aprovechar las oportunidades que pudieran afectarlas del entorno. En este contexto, además de formular la estrategia se logró la plena integración de organizaciones del territorio que apoyan a los agricultores y que han fortalecido el sistema de producción con enfoques agroecológicos.

Palabras clave: agroecología, participación, diagnóstico, estrategia de desarrollo

INTRODUCTION

In Cuba, during the 1990s, food production collapsed due to loss of imported fertilizers, pesticides, tractors, parts and oil products. The situation was so difficult that Cuba reported the worst growth of food production per capita in Latin America and the

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Caribbean. However, the island soon readjusted its agriculture to depend less on imports of synthetic chemical inputs and became a world-class example of ecological agriculture (1).

Agroecology is providing the scientific, methodological and technical basis for a new "agrarian revolution" worldwide. Production systems founded on agroecological principles are biodiverse, resilient, energetically efficient and socially fair, besides making up the basis of a strongly linked strategy to food sovereignty (2).

The main idea of agroecology is to go beyond alternative farming practices to develop agroecosystems with minimal dependence on agrochemicals and energy inputs. Agroecology is both a science and a set of practices. As a science, it is based on the "application of ecological science to the study, design and management of sustainable agroecosystems". This involves agricultural diversification intentionally focused on promoting biological interactions and beneficial synergies among agroecosystem components, so that enabling soil fertility regeneration, maintaining productivity and crop protection[A].

In diagnosing the present situation of industrial agriculture, increasingly serious limitations are observed in the socioeconomic, environmental and technical aspects, such as the inadequate food production for human health, energy inefficiency and irrational use of natural resources, human environmental degradation and particularly agricultural ecosystem reduction, loss of genetic resources in plants and animals, inefficient methods for controlling plant pests and diseases, high production costs, which coupled with low market prices impoverish the agricultural sector and countries of agricultural economy, causing higher environmental degradation and agricultural subordination of the industrial sector from developing countries to industrialized countries, specifically to multinational agricultural input producers; such problems characterize the current agricultural crisis (3).

An agroecological strategy can manage a sustainable agricultural development, in order to achieve the following long-term objectives: a) preserving natural resources and keeping constant levels of agricultural production; b) minimizing environmental impacts; c) fitting economic profits (feasibility and efficiency); d) meeting human and income needs; and e) satisfying the social needs of rural families and communities (nutrition, public health, education(4). Facing this situation, leaderships from the National Small Farmers' Association (ANAP) and Local Ministry of Agriculture (MINAG) are committed to implement some strategies with participatory agroecological approaches, so as to improve local productive systems, recover natural resources, enhance self-consumption and income generation to raise life quality, by taking into account producers' perceptions on what they know, what they understand and how they apply these good practices. Therefore, the objective of this research study was to evaluate the use and management of agroecological practices in agricultural farms from San Andrés locality.

MATERIALS AND METHODS

The research work was conducted in farms from San Andrés locality, La Palma municipality, Pinar del Rio province, which is located on a lixiviated Red Ferralitic soil, according to the new version of Soil Genetic Classification in Cuba (5) and the World Reference Base (6). This is a wavy-ridged, pre-mountainous area characterized by soils of low organic matter contents (1-2 %); its real depth values (horizon A depth) can range from 8 up to 45 cm, which evidently shows a higher level of degradation and lower possibilities to be exploited for agricultural purposes (6).

The methodology of study was founded on agroecological basic principles and designed through a participatory planning to implement developing strategies, besides including diagnostic methods to achieve the proposed objectives. The general outline of this research methodology consisted of three main stages: I- Identification and characterization of the most commonly used agroecological practices in the agricultural sector of San Andrés locality; II- A diagnosis to know farm limitations and potentialities to use and manage agroecological practices, and III- Participatory design of a developing strategy for a better use and management of agroecological practices in the community under study.

Several tools were combined with the aim of obtaining specific information on the degree of knowledge and use that farmers have about agroecological practices in the working areas,

[A] Mayorga, Y. Propuesta de producción agroecológica para la finca «La Paragua» Clavellina, Tucupita, estado Delta Amacuro, Venezuela. Tesis de Maestría, Universidad de Pinar del Río, 2011, Pinar del Río, Cuba.

such as: community visits, field trips and surveys as well as open interviews to a group of 20 producers, who were selected because they have already been identified in the territory as agroecological promoters since the research beginning; seven decision makers and five extension workers were also interviewed, who have to do with agricultural development in the municipality, all of them making up a total of 32 respondents.

Every survey and open interview was processed according to the percentage analysis method, which allowed getting a more representative and specific information.

The diagnosis consisted of a general farm characterization, considering the amount of farmers using agroecological practices, besides identifying the most common kinds of practices for them; in addition, their interest and willingness to implement these agroecological practices, their training needs and approaches were also studied.

WTSO (DAFO) matrix recorded from earlier participatory workshops and effective group works was applied to characterize, interpret and arrange the main problems in a hierarchical structure.

A strategic definition and design to use agroecological practices was attained by means of diagnostic results, the existing potentialities and analysis of alternatives according to the production program of cooperatives and agricultural enterprises.

RESULTS AND DISCUSSION

The diagnosis allowed to find out how much and what community producers know about agroecological practices, since data showed that 75 % surveyed farmers had already heard about them and just 35 % knew such practicesand what they consist of. Moreover, 62 % respondents were very interested in learning more about this production alternative.

On the other hand, 45 % surveyed farmers reported that every experience exchanged between producers and researchers is a satisfactory way to get the required information about seed production and preservation, soil conservation and fertilization alternatives, such as the use of biofertilizers, growth bio-promoting substances and biological products.

The exchange between researchers and technicians provide new participatory forms that enable to establish more horizontal relationships, whose results give benefits to technological innovation management, since they make feasible the introduction of seed diversity, test and propagation, which also helps strengthen agroecological agriculture in Cuba (7).

Ecological agriculture employs a set of more sustainable practices aimed to reduce negative effects on the environment, preserve soil fertility, increase the use of domestic resources and preserve biodiversity. Consequently, ecological management prohibits the use of chemically-synthetic products to have a fertilization based on organic matter application and the addition of legumes and green manures to crop rotations (8).

By the way, 90 % surveyed farmers reported that the most frequent available agroecological practices are: organic manure production and use of vermicompost, as one of the most important local practices for improving soil fertility.

Agricultural, forest, industrial or household residues constitute an alternative to organic manure production, due to the need of increasing crop yields for human foodstuff and reducing the use of agrochemicals (9).

Thus, 20 % farmers apply green manure usually from legumes cut and left in the field to decompose and fertilize it. Crop rotation is implemented just by 30 % surveyed farmers.

Green manure is an agronomic practice that consists of providing a non-decomposed vegetable mass from crop plants to enhance nutrient availability and soil properties (10). Another advantage is that it promotes soil biology, both the natural and species introduced through biofertilization (11).

Moreover, 70 % refer that one of the most commonly used agricultural practices in this area is the mixture of timber species with agricultural crops to protect soils, its moisture, the sources of water supply and it also reports family income.

The authors point out that the use of alley cropping or trees in association with annual crops, trees in association with perennial crops and hedgerows were the techniques performed within an agroforest system that allowed a more efficient use of land and agroecosystem productivity (12). Other studies conducted in La Palma, Pinar del Rio province (7), determined that the use of intercropping and crop associations allowed to a

more rational use of the available area in time and space within small traditional and ecological farms.

Meanwhile, 90 % surveyed farmers have got enough experience, mostly successful; although some are not so successful, they have also learned from them about drawing even or uneven curves to dig trenches, plant hedgerows or establish dead barriers. These are some complementary activities that help preserve soils and water.

Therefore, farmer-to-farmer methodology (13) is another way that producers have to learn and share experiences that help improve even their living conditions (14).

In Cuba, several innovative experiences have been developed to find people's food sovereignty safety through an active participation of various actors from our food industry sector, but mostly prioritizing the role of food producers. Two examples are urban agriculture and agroecological movement (13).

Then, 100 % producers have said that by implementing Decree Law 300, the state gives them the opportunity to enlarge their productive areas, improve their production, income and their family quality of life (15).

This diagnosis allowed to deal with different problems that producers had in relation to social and ecological elements and also showed that their lack of different inputs (synthetically-chemical fertilizers, pesticides, seeds and agricultural means) and organic products for plant nutrition or seed production in their own farm are mostly affecting agroecosystems, followed in order of importance by pest damages, low diversity of agricultural crops and low yields (Figure).

These problems are often common among producers; however, the required measures are not usually adopted to counteract the motivating factors. In this sense, it is important to raise farmers' technological level according to their particular social purpose or general agricultural items, in order to solve these difficulties (16).

Some other problems were identified by almost 30 % producers, such as insufficient water supply, deficient irrigation means, deficient manpower and lack of money capital for investments; however, these aspects are very important for agroecosystem sustainability, showing that actors are not always aware of what is affecting them and the need to make studies by means of participatory tools, so as to determine what allows to get the best results, in general, once in use.

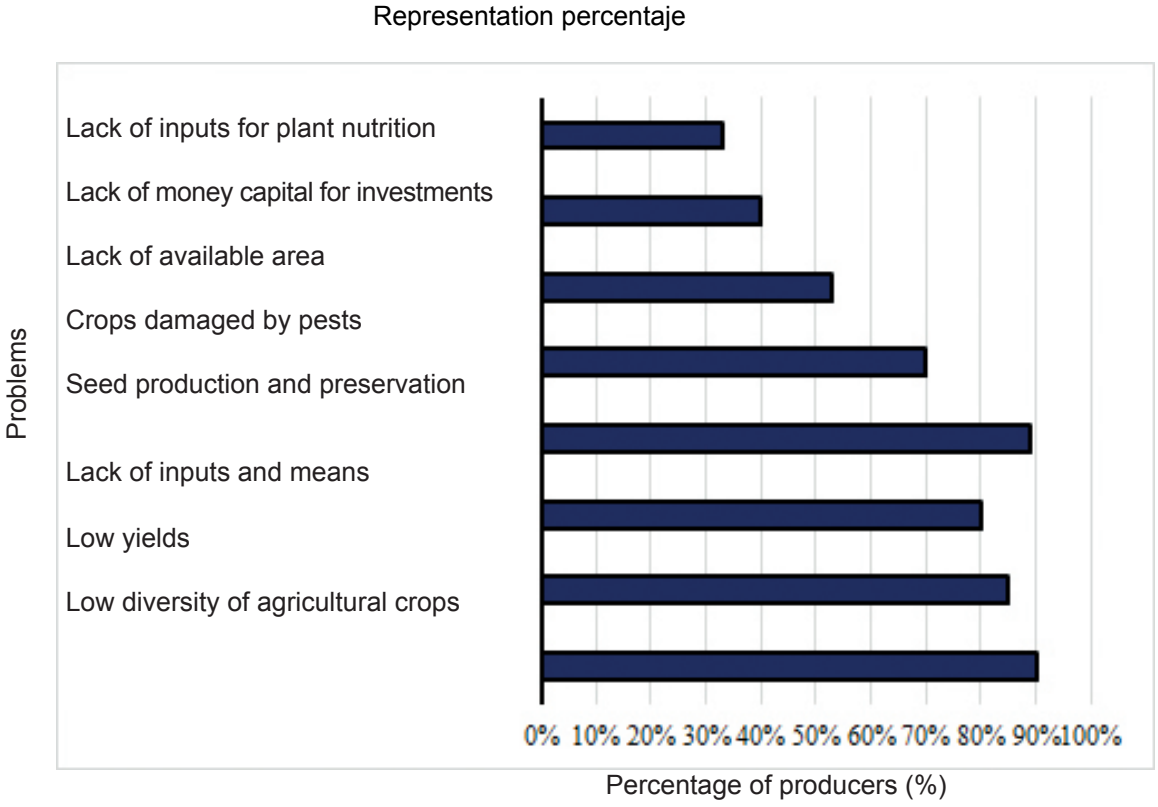

Figure. Percentage representation of the main problems identified

WTSO matrix recorded from earlier participatory workshops and effective group works was applied as a diagnostic tool to characterize, interpret and arrange the main problems in a hierarchical structure.

WTSO ANALYSIS

a) Internal analysis

Strengths (hierarchical)
- ♦ Use of organic fertilizers
- ♦ Use of green manures
- ♦ Use of agroforest systems
- ♦ Use of soil preservation measures
- ♦ Human resources
- ♦ Obtain strengthened service and credit cooperatives
- ♦ Safety market (demand)
- ♦ State will

Weaknesses (hierarchical)
- ♦ Low plant and animal diversity
- ♦ Deficient seed production and preservation
- ♦ Low yields
- ♦ Lack of inputs and means
- ♦ Crops damaged by pests and diseases
- ♦ Lack of available area
- ♦ Lack of money capital for investments
- ♦ Lack of nutrition inputs, pest and disease control

b) External analysis

Opportunities (hierarchical)
- ♦ Safety market
- ♦ Support of the agricultural enterprise and cooperative
- ♦ Upgraded technological packages for prioritized crops
- ♦ International cooperation
- ♦ Political will
- ♦ Close relationship with organizations, entities, national and international institutions
- ♦ Decree Law 300

Threats (hierarchical)
- ♦ Regulatory framework
- ♦ Delayed payment system
- ♦ Pest and disease occurrence
- ♦ Seed cost
- ♦ Weather events
- ♦ Restrictions in approving projects

WTSO MATRIX

Results and analysis from WTSO matrix enabled to determine the strategies to be followed to achieve better results. Such analysis takes into account the above mentioned weaknesses, threats, strengths and opportunities (Table).

Table. Results from WTSO analysis

Aspects	Opportunities	Threats
Strengths	Fo (offensive) 48	Fa (defensive) 19
Weaknesses	Do (adaptive) 37	Da (survival) 26

This implies that farm strengths to implement ecological farming practices should be reinforced, so as to counteract those environmental opportunities that may affect them. After analyzing the current situation as well as the internal and external factors affecting the use and management of agroecological practices, participants determined that, according to weakness ranking, the main problem was the low plant and animal diversity in farms; thus, regarding this participatory evaluation, a strategy was designed for a better use and management of agroecological practices in San Andrés farms from La Palma municipality, Pinar del Rio province.

Results proved that internal and external aspects should be strategically joined to outline efficient programs towards approaching sustainable development, in the process of prioritizing the most important aspects in agricultural systems.

STRATEGY FOR STRENGTHENING AGROECOLOGICAL PRACTICES IN FARMS

Aspects: Technological
Actions:
- ♦ Producers' exchange visits to know about successful experiences of agroecological production
- ♦ Promote the use of biofertilizers (Ecomic) and bioproducts (Azofert)
- ♦ Use of pest and disease tolerant varieties
- ♦ Establish plant diversity made up by cultivars and local genotypes
- ♦ Minimize the use of agrochemicals
- ♦ Efficient use of natural resources
- ♦ Provide an integrated system management as a whole

Aspects: Environmental
Actions:
- Use of organic fertilizers (manure, compost, earthworm humus)
- Green manure seeding
- Use live and dead barriers
- Contour seeding
- Rainwater collection
- Use of drought tolerant cultivars
- Use of mulch to reduce evapotranspiration
- Reduced use of inorganic fertilizers
- Avoid non-native species spreading

Aspects: Socio-economic

Actions:
- Develop projects
- Establish synergies with other projects affecting the locality
- Continue making producers and decision makers aware of change resistance to methodologies and practices
- Follow-up and monitoring
- Disseminate results
- Reflection process

Aspects: Training

Actions:
- Diversification
- Use of short-term renewable resources
- Minimize toxics
- Resource conservation
- Manage ecological relationships
- Adaptation to local media
- Integrated system management as a whole
- Maximize long-term benefits
- Assessment of environmental and human health
- Seed management and preservation
- Plant health
- Crop farming with agroecological approach
- Provide advantages of Law 300

CONCLUSIONS

- Producers from agricultural farms receive good social and ecological benefits by employing agroecological practices.
- Introduction of pest and disease tolerant cultivars, biofertilizers, bioproducts and establishment of local genotypes as part of the agroecological approach proposed for a sustainable farm development.
- Deficient crop rotation and poor green manure application by producers cause low soil fertility in this area.
- Farmers' exchange of experiences and use of participatory methodologies allow them to learn and share information that will help the process of strengthening capacities for a better use and management of agroecological practices.

BIBLIOGRAPHY

1. Altieri, M. y Funes, F. "The Paradox of Cuban Agriculture". *Monthly Review*, vol. 63, no. 8, 2012, pp. 3-14, ISSN 1365-2966.
2. Ferguson, B. G. y Morales, H. "Latin American Agroecologists Build a Powerful Scientific and Social Movement". *Journal of Sustainable Agriculture*, vol. 34, no. 4, 8 de abril de 2010, pp. 339-341, ISSN 1044-0046, DOI 10.1080/10440041003680049.
3. Altieri, M. A. y Toledo, V. M. "The agroecological revolution in Latin America: rescuing nature, ensuring food sovereignty and empowering peasants". *The Journal of Peasant Studies*, vol. 38, no. 3, 1 de julio de 2011, pp. 587-612, ISSN 0306-6150, DOI 10.1080/03066150.2011.582947.
4. Nicholls, C. I.; Osorio, L. y Altieri, M. A. Agroecología y resiliencia socioecológica: adaptándose al cambio climático. Ed. Red IberoAmericana de Agroecología para el Desarrollo de Sistemas Agrícolas Resilientes al Cambio Climático (REDAGRES), 2013, Medellín, Colombia, 218 p., ISBN 978-958-8790-32-9.
5. Hernández, J. A.; Pérez, J. J. M.; Bosch, I. D. y Castro, S. N. Clasificación de los suelos de Cuba 2015. Ed. Ediciones INCA, 2015, Mayabeque, Cuba, 93 p., ISBN 978-959-7023-77-7.
6. IUSS Working Group WRB. World reference base for soil resources 2006. A framework for international classification, correlation and communication. (ed. Micheli E.), (ser. World Soil Resources Reports, no. ser. 103), 2.ª ed., Ed. Food and Agriculture Organization of the United Nations, 2007, Rome, Italy, 128 p., ISBN 978-92-5-105511-3.
7. Márquez, M.; Valdés, N.; Ferro, E. M.; Paneque, I.; Rodríguez, Y.; Chirino, E.; Gómez, L. M.; Vargas, D. y Funes, F. "Análisis agroenergético de tipologías agrícolas en La Palma". En: Ríos H., Vargas D., y Funes F., Innovación agroecológica, adaptación y mitigación del cambio climático, Ed. Ediciones INCA, Mayabeque, Cuba, 2011, pp. 105-122, ISBN 978-959-7023-52-4.
8. Sans, F. X.; Armengot, L.; Bassa, M.; Blanco, M. J. M.; Caballero, L. B.; Chamorro, L. y José, M. L. "La intensificación agrícola y la diversidad vegetal en los sistemas cerealistas de secano mediterráneos: implicaciones para la conservación". *Revista Ecosistemas*, vol. 22, no. 1, 2013, pp. 30-35, ISSN 1697-2473, DOI 10.7818/re.2014.22-1.00.

9. Ramos, A. D. y Terry, A. E. “Generalidades de los abonos orgánicos: Importancia del Bocashi como alternativa nutricional para suelos y plantas”. *Cultivos Tropicales*, vol. 35, no. 4, diciembre de 2014, pp. 52-59, ISSN 0258-5936.
10. Martín, G. M. y Rivera, R. “Influencia de la inoculación micorrízica en los abonos verdes. Efecto sobre el cultivo principal. Estudio de caso: el maíz”. *Cultivos Tropicales,* vol. 36, no. supl. 1, 2015, pp. 34-50, ISSN 0258-5936.
11. Martín, A. G. M. y Rivera, E. R. “Efecto económico de la rotación canavalia-maíz y de la sustitución parcial de fertilizantes minerales”. *Cultivos Tropicales*, vol. 36, no. 3, septiembre de 2015, pp. 34-39, ISSN 0258-5936.
12. Pavón, R. M. I.; Dominí, C. M. E.; Suárez, V. G. M.; Flores, J. y Almenares, G. G. R. “Sistema agroforestal para el uso racional del suelo en el municipio San José de las Lajas, provincia Mayabeque”. *Cultivos Tropicales*, vol. 35, no. 2, junio de 2014, pp. 14-20, ISSN 0258-5936.
13. Martínez, F. Z.; Bakker, N. y Gómez, L. “Herramientas para la Metodología Campesino a Campesino: innovación pedagógica para construir saberes agroecológicos”. *LEISA Revista de Agroecología*, vol. 26, no. 4, 2010, pp. 9-11, ISSN 1729-7419.
14. Ortiz, R.; Angarica, L. y Schmid, M. M. “Diseño y evaluación participativa de efectos directos (cambio de actitud) en proyectos de Innovación Agropecuaria Local (PIAL)”. *Cultivos Tropicales*, vol. 31, no. 4, diciembre de 2010, pp. 12-19, ISSN 0258-5936.
15. Ministerio de la Agricultura y Ministerio de Finanzas y Precios. “Decreto-Ley No. 300 Sobre la estrategia de tierras estatales ociosas en usufructo”. Gaceta Oficial de la República de Cuba, vol. 110, no. 45, 20 de septiembre de 2012, ISSN 1682-7511.
16. Gómez, C. H.; Galdámez, F. D.; Guevara, H. F.; Ley, de C. A. y Pinto, R. R. “Evaluación de áreas ganaderas en la zona de amortiguamiento de una reserva natural en Chiapas, México”. ITEA, Información Técnica Económica Agraria, vol. 109, no. 1, 2013, pp. 69-85, ISSN 1699-6887.

Received: December 18, 2014
Accepted: November 3, 2015

Revista Cultivos Tropicales
Instituto Nacional de Ciencias Agrícolas