7th CIRIEC International Research Conference on

Social and Solidarity Economy

Horticultural social cooperatives and acknowledgment of mechanical development: patterns and qualities for improving their productivity

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Abstract

This paper researches, presents technological innovation by social agricultural cooperatives. These social cooperatives possess some special characteristics, by comparison to other types of primary producers and are considered as lagging or even resisting innovation adoption. Consequently, the first part of the paper presents some general notions of progress, growth an innovation and challenges their mainstream definition by placing within a defined cultural and philosophical framework. The second part of the chapter deals with social economic aspects of technology innovation and innovation diffusion especially as they relate to social agricultural cooperatives. The third part explain a series of case studies derived from different countries representing diverse cultural, social developmental and social organizational characteristics by placing emphasis on traceability and on certification of plant propagation material as examples of social technological innovation

JEL codes: O17, P31, Z13

Keywords: social agricultural cooperatives, Farming, Investment, Innovation System

1. Prepared for 7th CIRIEC International Research Conference on Social and Solidarity Economy, Bucharest, Romania, 6th – 9th June 2019. The author thank the conference of CIRIEC for valuable comments and suggestions.
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1. Introduction

General thoughts of evolution and development; social bases

Historically, the notion of progress has been central in the understanding, interpretation and function of science and technology. Similarly, the notion of social progress has been applied within the context of various types of societies. Nevertheless, the definition of progress, its actual meaning, manifestations and consequences for science, technology and mainly societies is contested; 'elusive' as at least one author almost in the beginning of the last century suggests (Woods, 1907:779). Other authors focus on the critical importance that the idea of progress has for Western civilization and in particular, the value that the so-called Western world and intellect has placed on the historical movement from past to present to future perceived to occur in a more or less continuous, gradual, cumulative and mostly uni-linear fashion (Nisbet, 2009:4-5). Put another way, albeit simplified, it can be argued that to some extent "the idea of progress holds that mankind has advanced in the past—from some aboriginal condition of primitiveness, barbarism, or even nullity—is now advancing, and will continue to advance through the foreseeable future" (Nisbet, 2009:4-5). A dominant assumption, at times implicit and, other times explicit, in this approach to progress, is the assumption that progress is a process that leads from an 'inferior' to a 'superior' state of affairs liberating humans from ignorance and fear and leading them to civilization and material and spiritual achievements; an assumption clearly portrayed in Aeschylus' *Prometheus Bound*.

In the realm of social sciences the concept of progress was addressed by theorists such as August Comte who sees progress as the right balance between conservative and innovative forces (2011:389), Karl Marx who envisions progress through revolution and the overcoming of human alienation, the so-called Social Darwinists or social evolutionists who linked progress to evolution (Sklair, 2001:xiii) and later on, Max Weber and Emile Durkheim who although not concerned with progress *per se* they view societies as progressively adopting more complex, individualistic forms of organization with increased levels of specialization (Sklair, 2001:xiii).
In societies such as the above, however, critical is the belief in rationality and the quantification of natural and social phenomena which in turn underline the promise and the deriving expectations that science and technology perceived to be *value free*, ideologically neutral, can continue delivering a better future; deliver progress (Kosellek, 2004). Viewed in this way then, progress is a modern phenomenon (Borup et al., 2006).

Smallholder agriculturists in developing nations confront a few complex generation and marketing imperatives that ruin the progress of livelihoods. Some of these issues are identified with: market blemishes prompting high exchange expenses of getting to information and yield markets, poor framework and physical scattering of the smallholders, poor access to credit administrations, specialized lack of ability of the farmers to adapt to current technologies and changing purchaser inclinations (e.g., nourishment wellbeing guidelines), and so on. Various investigations recommend that smallholders could conquer such imperatives if composed into aggregate activity gatherings, for example, cooperatives (Narrod et al., 2009; Bernard et al., 2010; Wanyama et al., 2015). Thus, cooperatives have been by and large considered as associations assuming noteworthy financial parts, among others, by lessening exchange costs and enhancing the bartering energy of people in all divisions including farming (Staatz, 1987; Bonin

et al., 1993; Bernard et al., 2008; Francesconi and Ruben, 2012). In such manner, agrarian cooperatives in particular are perceived as real instruments to battle destitution in country regions where over 70% of the world's poor live (Deriada, 2005; FAO, 2012). Be that as it may, conflicting discoveries and fluctuating levels of accomplishment were accounted for with respect to the execution and advantages of agricultural cooperatives in past investigations to some extent because of the shifting idea of cooperatives and examinations strategies utilized. Some higher costs (Wollni and Zeller, 2007), green bean promoting co-agents in Kenya where individuals figured out how to meet a nourishment security standard that influenced them to stay aggressive (Narrod et al., 2009), banana agriculturist associations in Kenya where offering through agreeable have conveyed a higher pay to individuals paying little heed to humble value premium offered (Fischer and Qaim, 2012). Francesconi and Ruben (2012) likewise featured a positive effect of helpful participation on drain creation and efficiency in Ethiopia. Besides, a few investigations on the Ethiopian espresso co-agents additionally tended to financial advantages that individuals got through guaranteeing reasonable exchange, making market linkages, or by enhancing esteem chains (Kodama, 2007; Emana, 2009; Getnet and Anullo, 2012). A few investigations in different cases featured advantages of cooperatives; for example, Abate et al. (2014) recognized enhanced specialized proficiency of individuals from agrarian co-agents due to better access to profitable sources of info and services when contrasted with non-members, Abebaw and Haile (2013) additionally indicated enhanced selection of mineral composts by agreeable individuals in Ethiopia.

On the other hand, many instances of poor execution (and therefore low effect) of horticultural cooperatives have likewise been accounted for from developing nations. For example, Nkhoma and Conforte (2011) demonstrated the trouble that cooperatives in Malawi face to fabricate a feasible advertising position for the most part because of frail administration, administration and market get to that in this way disheartened individuals. Bernard et al. (2008) likewise demonstrated unsuccessful instances of grain showcasing cooperatives in expanding commercialization in Ethiopia, while offering higher costs to their individuals. In a few events, part responsibility and participation in cooperatives (urgent for helpful supportability and execution) were recognized to be low to a great degree. For example, Anteneh et al. (2011) announced that exclusive 42% of individuals pitch their coffee to their separate cooperatives because of a few reasons, for example, the powerlessness of cooperatives to give attributes and to pay money to farmers on the spot upon coffee conveyance. They additionally noticed that most private brokers give propel installment as a credit for agriculturists amid off-season (when ranchers are in basic need of money), and influence forthright installment when agriculturists to convey coffee, which make most smallholder farmers to incline toward private merchants to cooperatives. In different investigations, Fischer and Qaim (2012) showed that around 40% of the individuals from banana showcasing cooperatives in Kenya neglected to take an interest in aggregate advertising, i.e., they offer their banana exclusively. Later confirmation from Ethiopia demonstrates that most ranch families pitch their yields to nearby brokers, different agriculturists, or straightforwardly to customers, instead of through co-agents (Bernard et al., 2013). A similar report additionally recognized that being coffee maker is contrarily associated with cooperative support however frequently lauded as the best horticultural cooperatives in Ethiopia. These different investigations are consistent in focusing on the way that agreeable membership and the levels of support profit by co-agents and make a difference. In rundown, the examinations appear: (I) cooperatives can't just be summed up as though they are profiting every

one of their individuals at all locations. Their execution and effects fluctuate crosswise over nations and areas even inside an indistinguishable part crosswise over wares from indicated by Bernard et al. (2013); (ii) authoritative and aptitude skill of the chiefs, and shifting levels of part investment additionally decide the achievement and effect of co-agents; (iii) free rider issues, which may have been developing because of shortcomings in helpful administration, a hole in controls, or low advantages of cooperatives, appears a far reaching issue as shown in some showcasing cooperatives where individuals offer their item not to their cooperatives; and (iv) advancements are continuing with respect to the advantages and interests of individuals as in the instance of coffee cooperatives that used to be commended as extraordinary entertainers, yet low support of individuals is as of late observed (Bernard et al., 2013). In this manner, it's conceivable to break down and create more confirmation with respect to the determinants and financial effects of cooperatives by nearly analyzing, through utilizing diverse strategies, the particular instance of coffee farmer cooperatives in the Jimma Zone of Oromia local state, Ethiopia. Therefore, the hypoth-eses of this article are: (1) financial and statistic factors influence the family units' enrollment choice in an agreeable, and (2) participation in a helpful positively affects the income and resources of the individuals. Dissimilar to past examinations, the investigation depends on a family unit overview increased with gather discourses that assistance address issues that are hard to catch quantitatively. Eye to eye meetings of 305 coffee farmers and four gathering discourses were directed. A penchant score coordinating (PSM) and endogenous exchanging relapse (ESR) models are utilized to gauge treatment impacts by controlling for choice predispositions. It is believed that the discoveries of this examination will add to endeavors in planning viable strategy instruments in creating maintainable cooperatives customized towards enhancing agrarian efficiency and thus welfare in provincial Ethiopia and past.

Part II

Economics of Development in Farming; a short overview

Simon Kuznets (1962) stated that "the greatest barrier in understanding the role of innovation in economic processes has been the lack of meaningful measures of innovative inputs and outputs". Schumpeter (1942) in his Capitalism, Socialism and Democracy also probed into the subject, concluding that innovations are generated by established, large firms with monopoly power because only such firms had the ability control and command the resources for research and development. Investment, innovation and diffusion are closely interrelated through multiple layers. The following sections begin with the role of investment and its relation to innovation. The returns, the role of different stakeholders and the control that each of them exercise to investment is briefly discussed. A definition of innovation is provided. Different classifications of innovation are presented as well as the way each of them is differentiated in terms of adoption and investment. Finally, different measures of diffusion are presented, including theoretical and empirical models. Diffusion is analyzed with respect to its influence by the size of the firm, risk, uncertainty, geography, access to credit, land ownership and other characteristics.

Investment in Agriculture: Economic and Policy issues

Investment in agricultural innovation technology can be either public or private. Public investment in agricultural research and extensions have high rates of returns that, according to some researchers, see Huffman (1998) and Alston et al. (1995), could be as high as high as 20 percent or more. This could indicate that there is a considerable underinvestment. Studies evaluating returns of agriculture to society are based on a partial equilibrium analysis. Moreover, even though the social gain from research is positive, there can be cases where the producers might be in a worse position than before because the demand is sufficiently inelastic in that industry (Griliches, 1957). Subsequently, different stakeholders have different interests and gains from research. Mechanical innovation while benefiting society overall might be harmful to workers, a well-studied example is the introduction of the tomato harvester in California (Schmitz & Seckler (1970). de Gorter & Zilberman (1990) provide a mathematical model that analyzes the public good inputs in agriculture, concluding that underinvestment is likely to occur when producers control the level of investment and finance it. The less elastic is the demand for the final product, the less optimal it is to invest if they invest at all. This has also spawned several political implications that producer groups can lobby for an underinvestment in research. Rausser & Zusman (1991) use a cooperative game theoretic framework to illustrate how the political system decides on water quality and pricing matters. This can also be extended in the framework of agricultural research where the government decides to put more weight to the vested interests of agricultural producers than the taxpayers, unless they are compensated. This analysis is insightful in describing the process for public support in agricultural research and development, and ultimately, innovations. Therefore the public sector has been very important in supporting and funding agricultural research and development, especially non-shielded disembodied or embodied innovations (Sunding & Zilberman, 2001) Cooperatives, like any firm, invest in technologies that provide the best-expected benefits. The term expected is used because investments, by definition, entail a level of uncertainty. The benefits and the costs can differ across cooperatives depending on their size, their specialization and the willingness and commitment of the members. On a farm level they might differ depending on the size, the human capital and the land quality among other factors.

Innovation: Definition and classifications in agriculture

Innovations are the basic element of technological change. In the current framework, innovations are defined as new methods, customs, or devices used to perform new tasks. There are several categories of innovations. We can distinguish them between innovations that are embodied in capital goods or products (e.g., improved varieties of seeds, tractors, fertilizers) and those that are disembodied (e.g., integrated pest management schemes). Embodied innovations are more likely to be generated by private parties, however, it is necessary that intellectual property rights are protected for that to be possible. On the other hand, disembodied innovations are less likely to receive private funding because of the difficulties in marketing and selling the end product. Therefore it usually becomes the area of public action. Classifications of innovation can also be done according to their form. Subsequently, they can be categorized as biological innovations (seed), chemical innovations (fertilizers and pesticides), mechanical innovations

(tractors), agronomic innovations (new management practices), biotechnological and informational innovations (computerization of agricultural cooperatives).
Innovations can also be distinguished based on their economic impact. Henceforth, there are yield-increasing, cost reducing, quality-enhancing, risk-reducing, environmental-protection increasing and shelf-life enhancing innovations. Most innovations might fall to one or more of these categories. The importance of categorization stems from the fact that it renders the analysis of the forces and factors that lead to the adoption of new technologies more clear. Hence agricultural cooperatives that introduce new pesticides, adopt a yield-increasing, risk reducing, environmental-protection increasing and shelf-life enhancing innovation (Sunding & Zilberman, 2001). This means that we should also take into account all the factors, such as the degree of risk-aversion, when we want to analyze the forces behind the adoption of new technologies.

Innovation process in agricultural production.

By definition, an agricultural value chain refers to all collaborators (from farmers and their cooperatives to final distributors and consumers) and their activities in input supply, production, processing, transport, distribution, marketing and purchasing of a particular final product or a group of closely related products (Anandajayasekeram, 2011). The addition of value in the product through its route, from producers to consumers, is of particular interest. Value addition to a product is the outcome of diverse activities (cleaning, bulking, packaging and transporting) at each stage in the value chain mediated by different groups of people.
Innovation process in agricultural production may be divided in four major steps (Anandajayasekeram, 2011)

1. Invention (it includes the scientific contribution to priority problems solving)
2. Transformation of scientific results into novel technological processes or products
3. Commercialization of processes or products
4. Adoption of novel products by consumers and validation of socioeconomic benefits of the new technology.

Drawbacks in the innovation process.

An innovation platform is a physical or virtual environment for thinking, talking, sharing ideas, discussing problems, listening, learning and collaborating with the aim to innovate. There were many drawbacks in the innovation process in the past (Dons & Bino, 2008). Science was mainly curiosity-driven and the importance of its applications was sidelined. The commercialization/industrialization of science was not seen as a crucial factor and was even considered as a threat for the independence of the universities. Finally, establishing relationships with the private sector (industry) was an underestimated factor for the success of the innovation platforms. According to a certain understanding a major constraint in agricultural development is that agricultural research is under the supervision of the Ministry of Agriculture in most

developing countries (Anandajayasekeram, 2011). It is proposed by the same authors that if the responsible agency was the Ministry of Science a lot of constraints would be easily bypassed. The higher education system is focused on teaching and thesis supervision rather than Research and Development (Anandajayasekeram, 2011). The orientation of agricultural research and related priorities must also be reconsidered. For example, a shift from the "prescriptive" tradition towards participatory and action-oriented research in developing countries is absolutely necessary (Anandajayasekeram, 2011).

The Role of Cooperatives into Agricultural Innovation Systems.

Co-operations must be incorporated into collaborative Agricultural Innovation Systems which include all the organizations actively participating in technological change in agriculture. An Agricultural Innovation System (Anandajayasekeram, 2011) is an arrangement of institutions and persons which includes all participants ranging from agricultural research institutes to farmer's organizations as well as their collaborations with the private sector (local, national, and multinationals agro-industrial firms). Each agricultural technological innovation must acquire acceptance of consumers, pressure groups and their organizations and be compatible with regulations, laws, norms, customs and beliefs that affect the development and diffusion of the innovation process. There is absolute priority to harmonize the Research and Development planning and implementation in the context of the economical, political and cultural interrelationships in which it takes place. The innovative dynamics of a country depends not only on the dynamics of each individual participant (universities, research institutes, co-operations, private sector), but also on their collaboration, the relationships and interactions between these components as elements of a collective system and their interaction with the society.

Introduced technologies vs. locally developed innovation and the role of Cooperatives.

Introduced technologies are frequently less appropriate for addressing challenges than locally developed approaches. Locally developed innovation is adapted to local conditions within which it has been developed (Scogings et al, 2009) especially because farmers and farmer co-operatives can acquire an active role in contributing ideas, initiating research activities or re-orienting research to harmonize with their priorities and motivations. The next step in this more balanced partnership is development programs driven by farmers' ideas. This is a truly 'participatory' approach where farmers and co-operatives play an active role in the process that, in general, involves a very complex set of participants. Another critical factor for a successful agricultural innovation system is its adeptness in addressing challenges that local farmers and innovators are experiencing in each separate country (Scogings et al, 2009). One additional challenge is to support local innovation facilities while making these facilities available to farmers. This, for example, is the aim of a program co-ordinated by the Prolinnova (**PRO**moting **L**ocal **INNOVA**tion) network. Prolinnova is a network operational in 20 countries in Asia, Africa and South America which is coordinated by a Non-Governmental Organization (NGO) based in the Netherlands. Farmer's organizations and co-operatives form a network with

educational institutions, government departments and NGOs focused to promote ecologically oriented agriculture and participatory R&D approaches. Local Innovation Support Facilities supported by the Prolinnova network are engaged in enhancing the impact of local innovation by supporting access to financial resources. Such facilities have already been established on a pilot basis and in a number of communities due to a Prolinnova supported initiative FAIR (Farmer Access to Innovation Resources). Enhancing farmers' innovative capacity is achieved by establishing locally managed funds to purchase materials and inputs needed for experiments and bringing the necessary expertise and skills which are necessary for the experiment or investigation (Scogings et al, 2009). The benefit from such programs is the opportunity to adapt research to local needs and to propose solutions harmonized with local cultures and familiar to local farmers rather than applying externally (and often inappropriate) derived ideas.

The role of Agricultural Research Information Systems in Cooperatives innovation.

An Agricultural Research Information System (ARIS) can be defined "as a system that enables **digital connectivity** among **institutions** and **stakeholders** engaged in agricultural research within countries for sharing **scientific**, **technical** and **research management** information; and supports, in full or part, the **infrastructure** and **services** for electronic messaging and **communication among participating institutions**" (Maru, 2002). By definition, an ARIS is a common information system with the ability to provide an organizational backbone to spread and diffuse information among the national agricultural research institutions (Sadovaskaya, 1999; Singh, 1998). This network of agricultural research institutions is based on the implementation of new Information and Communication Technologies (ICT) and is a critical factor for agricultural development especially in under-developed or developing countries in Africa, Asia and Latin and Central America (Maru, 2002). The success of an ARIS is dependent on the ability of the national agricultural innovation system to competitively share information. An ARIS must be structured with the flexibility to share appropriate information with its clients and partners (for example, co-operations) in agricultural innovation. The next level of ARIS development is the orientation towards supporting Research Institutes to seek new partners at national, regional and global level (Maru, 2002).
Τριτο μερος

Agricultural cooperatives; Innovation strategies and diverse case studies

Definition of rural cooperatives

A rural cooperative is characterized by the International Cooperative Alliance (http://www.ica.coop/coop/index.html) as: ``a self-sufficient relationship of people joined intentionally to meet their regular financial, social, and cultural needs and goals through a together claimed and equitably controlled undertaking". The horticultural area has heterogeneous and testing mechanical requests. Subsequently, in the event that we are worried about which kind

of advancement framework is alluring, it is hard to assign a solitary promising and proficient paradigm which fits the part of cooperatives (Fronzaglia et al, 2008).

Innovation strategies adopted by cooperatives: A case study from Spain.

Agriculture, as a production sector, has many limitations; a major one being its fragmented structure. This becomes immediately apparent when a traceability system is attempted to be introduced. Such limitations could be easily overcome by the collaborative structures used by co-operatives or unions of co-operatives which desire traceability or guaranteed quality attributes.
Several agricultural cooperatives in the Region of Valencia, Spain (where the cooperative sector is deeply rooted) have adopted innovation strategies to increase added-value of their products (Ortiz-Miranda et al, 2010). Traceability, quality standards and food safety requirements are being implemented during the last years as a response to increasing concerns about food safety and animal health. These innovation strategies can be classified as new configurations of AFNs (alternative food networks). In that case individual cooperatives formed a cooperation framework with the aim to create a common trademark (Ortiz-Miranda et al, 2010). The network of cooperatives centralizes transaction costs while it deals with the certification authority and bureaucracy. This framework emphasizes (Ortiz-Miranda et al, 2010) locally based (and organic) characteristics of products (for example, production of oil exclusively from autochthonous varieties or from thousand-year-old trees). Of course, there is a demand for organic certification as well as for traceability of the oil. New processing lines have evolved to separate organic from conventional production. Territory-based labeling of olive oil from the Mountain of Castello (Valencia, Spain) is a promising example where traceability can be coupled with molecular techniques. In the future, cooperatives have the opportunity to implement molecular traceability techniques for olive oil using DNA extracted from oil and polymerase chain reaction (PCR) amplification of simple sequence repeat (SSR) markers (Raieta et al, 2015) (Corrado et al, 2011) (Rotondi et al, 2011). If technical support (experimentation and diffusion of information) can be coupled with convincing potential technology adopters, then implementation of traceability techniques will add value to the product. On the other hand, environmentally friendly farming practices already enable the cooperatives to claim quality certification for their "organic" production. In addition to increased shelf price food quality improvement can be further linked with tourism and the culinary sector.

The three-legged stool model for the role of research in the innovation process.

Blackswan (2010) proposed an illustration of a three-legged stool for the role of research in the innovation process and the diffusion / commercialization of knowledge (Blackswan, 2010). The first leg (critical element) of the stool is knowledge generated through basic research. The second leg is the ability to transform ideas and experimental findings into real products and services through adaptive applied research. The third leg is the ability for marketing and commercialization of the ideas. These three legs in the innovation process must be of the same length to achieve a stable effective structure. Customers (end users) are the necessary platform to hold the legs and to support the stool (institutes, institutions, government, and society). The stability of the overall system depends on the stability of each individual part.

Agricultural research-for-development (AR4D) projects: A case study from Dutch agricultural innovation system.

The Dutch agricultural innovation system can be used as a case study for the reliability of the three-legged stool model (Dons & Bino, 2008). During the previous years, significant changes have taken place in Dutch agricultural innovation system for the reorganization of the knowledge system and re-orientation of the interactions of research organizations with the private sector. The classical linear scheme of information flow (from basic/ fundamental university research towards implementation/commercialization through the intermediate step of strategic and applied research at governmental research institutes and experimental stations) has been replaced with more flexible forms of collaboration. In fact, we are in the middle of a transition phase where the classical model is replaced by more open forms of co-innovation and collaboration between research centers and industries (Dons & Bino, 2008). This co -innovation model ([the so-called public–private partnership (PPP)] is based on close collaboration of various stakeholders in a more open and dynamic system. In the Netherlands, the agro-food research and agro-food industrial complex exist in close interaction for many decades and this is the key for the expansion of the agricultural innovation system (Dons & Bino, 2008).
This model radically transforms collaboration in Research and Development as well as in education. Education as well as academic research and industries all work together to form a network system which in turn establishes effective education programs.
Nowadays, Dutch agricultural innovation system is considered a critical success factor for the strong development of Dutch horticulture.

An individual development case: traceability

Traceability is characterized as "the ability for remaking I) the starting point of materials and segments utilized amid the creation, ii) the historical backdrop of the procedures utilized amid appropriation and iii) the recognizable proof of the area of the item after conveyance inside the store network utilizing archived distinguishing pieces of proof (Giacomini et al, 2002; Giacomini and Mancini, 2001). These distinguishing pieces of proof are identified with the streams of material and every traceability framework must be stretched out all through the entire store network. The ISO 8402 standard alludes to "organization" traceability as the "capacity to remember the history or area of a substance utilizing recorded distinguishing proof information". The expression "traceability framework" is demonstrative of two unique procedures: I) following (the procedure which the item takes after all through the entire inventory network), and ii) the switch procedure (following) which enables the item to be followed back up the chain). The presence of a traceability framework gives the included makers and preparing cooperatives (or organizations) an intense aggressive apparatus/rivalry instrument. It gives them the open door I) to build up enhanced creation of items, ii) to oversee stock all the more effectively through the recognizable proof process, iii) to institutionalize the included exercises lastly iv) it adds to the expansion of the item esteem and entry of extra expenses to the (willing to pay for this "unrivaled" item) buyer (Giacomini et al, 2002; Giacomini and Mancini, 2001)

Implementing traceability solutions by cooperatives. A case study from Emilia Romagna Region (Italy).

A traceability model system has been adopted (Giacomini et al, 2002; Giacomini & Mancini, 2001) by a Italian fruit and vegetable farmers co-operative (about 500 small and medium-size farms) located in the Emilia Romagna Region (province of Modena, Italy). This co-operative replied to a growing consumer demand for product traceability and for safe food products in terms of hygiene and quality by establishing a robust traceability system as the only way to become competitive in terms of quality and safety of the products. Various EU directives and regulations have been activated since the early 1980s in order to systematically monitor the residue levels of pesticides in food stuffs and to encourage the spread of phytopathological control agents with low-environmental-impact by implementing organic, supervised and integrated techniques in the vegetable and fruit sector.

The implementation of a traceability system enforced the reorganization of the Emilia Romagna Region co-operative (Giacomini et al, 2002; Giacomini & Mancini, 2001). The implementation of traceability services was accompanied by an increase in production costs (costs for the purchase of the computers, hardware and software, costs for the purchase of the optical readers and costs of phyto-sanitary data production and management) and redefinition of contractual relations with their suppliers. The Emilia Romagna Region co-operative managed to recover the greatest part of the costs by selling the software packages which were developed by the co-operative to the union of Italian co-operatives (CONERPO consortium) for installation, in all the co-operatives associated with CONERPO (Giacomini et al, 2002; Giacomini & Mancini, 2001). Furthermore, the added value (provided by the traceability possess) to its products enabled the co-operative to penetrate new markets such as Casino and Carrefour which require complete product traceability rom their suppliers and increased its competitiveness with respect to other private sector competitors in general. Furthermore, it was very easy to adopt their specifications, given the fact that it had already all the organizational skills and capacities required

Can cooperatives be involved in other types of traceability systems? Geographical Indications is a promising example.

The EU (European Union) protects high-quality agricultural products based on geographical location by using designations of GIs (geographic indications) since 1992 (Babcock, 2015; Babcock & Clemens, 2004). EU and other countries are trying to expand this type of protection through geographical indications and negotiate about this issue with WTO (World Trade Organization). On the other side, a certification mark is a type of trademark which can be obtained by U.S. processors and producers and provides, similarly to geographic indications, protection with the limitation that the protection of the products is not applicable outside the United States (Babcock, 2015; Babcock & Clemens, 2004). To ensure the high quality status of products Protected by Geographical Indications, it is required that each producer or co-operative maintains detailed records to include the origin and quality of the product, production data, quantities produced, control procedures for the finished product, and information to permit traceability. Agricultural cooperatives with experience in the implementation of traceability systems in general can easily expand to adopting a traceability system that would also include geographical indications.

Results and discussion

The guarantee of actualizing a traceability framework for Plant Propagation material by horticultural cooperatives.

Quality necessities in regards to wellbeing, virtue and character of farming items and additionally post-control and similar tests and marking increment the request of executing traceability devices in rural practice. Sooner or later numerous unsafe creatures will sneak past and cause decimating episodes because of the high volumes of universal trade with nations where hurtful irritations are across the board in plant spread material. Plant Propagation (regenerative) material is a crucial factor for the nature of agrarian nourishment items and general wellbeing and also the profitability and organic decent variety. In the event that agriculturists, co-agents and even governments won't fit to a generally acknowledged plant wellbeing administration, expansive scale episodes caused by unsafe life forms can prompt an expansion underway misfortunes and expenses. Then again, if co-agents can receive an (atomic) traceability framework committed to observation of plant regenerative material, numerous flare-ups of hurtful nuisances can be distinguished in plant spread material and effectively annihilated. Also such a framework can first protect consistent with typeness of conceptive material itself. Obviously, there is a necessity for logical help for the improvement of traceability frameworks (atomic, strategic or something else) and for coordinated effort of co-agents with demonstrative research centers. As said at first in 3.2, novel atomic science strategies include a progression of disclosures, for example, confinement chemicals for DNA particles fracture, advancement of procedures, for example, PCR for intensification of DNA pieces and recently presentation of second era enormous DNA sequencing. These revelations make another imaginative tool kit for plant raisers to unwind the hereditary variety in the plant germplasm (Dons and Bino, 2008). For instance, Amplified Fragment Length Polymorphisms (AFLPs) were created as an atomic marker innovation in 1990 by Keygene (Vos et al, 1995). It turned into a boundless institutionalized innovation for reproducers crosswise over many plant and creature species and empowered them to utilize genotyping as opposed to phenotyping in the determination procedure and achieve a reasonable understanding into the hereditary variety of their rearing lines. Such DNA fingerprinting advances, like SSR markers said in 3.2, have reformed plant reproducing and are utilized routinely by rearing organizations for some vegetable yields. At present, a variety of more productive atomic marker advancements are routinely utilized by inquire about labs and hold the guarantee for institutionalization, scattering and commercial end use.

Conclusion

The underlying advantages of utilization of the more productive molecular systems went for the discovery and control of hurtful life forms (plant pathogens) identify with deferring or totally maintaining a strategic distance from spread of such life forms. Therefore, lessening or even keeping away misfortunes because of plant ailments, in the farm, amid capacity or in the self, in a roundabout way prompts to gains in aggressiveness for which horticultural cooperatives would turn into the primary recipients. Positive financial effects from an enhanced plant wellbeing status would balance the expanded plant pathogen discovery and plant material traceability costs.

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