Service Organization and Evolution in Europe

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SUMMARY - The extension services belong to the Agricultural Knowledge System (AKS), that comprehends research and higher education in agriculture too. The services transmit the information on technical and managerial innovations to farmers and translate the innovation's demand into research and higher education, thus playing a double "pivot" function: one inside the organization of farming and rural systems and other in the natural and social systems' co-evolution. We must make an effort to better link natural and social sciences in order to explain the Gaia hypothesis' evolutionary games. This effort is possible through a set of models that utilize the information, organization, change and evolution's paradigm in a similar way. Generally, the SR-information in the biological and social systems and, particularly, the knowledge accumulated in the "human capital" are the key words that may unify the natural and social co-evolution. The services actively work on the "knowledge spiral" segment, where the agrarian sciences' explicit and, codified knowledge is converted into tacit, contextual knowledge of farmers, directly contributing to farmers competitive capabilities as an important component of farming and rural networks' organization and indirectly as a strong factor of AKS' growth. The services organization empirically shows an evolutionary feature, according to technological change and social evolution, as well as it is described by the development stages. Developed countries are questioning if the AKS is still important in affluent societies: the OECD conference in Paris in 1995 replied that food quality and safety, rural world mantainence, environment preservation and sustainability of economic development are all the goals that still need a strong AKS in developed countries too. In the third millennium the extension services will have the task to master social and natural co-evolution so that the speed of the economic development does not destroy the capability of the natural and social systems' evolution to live side by side.

Key words: Information, organization, change, evolution, extension services, rural "world", "Gaia" hypothesis.

RESUME - *"Organisation et évolution des services de vulgarisation agricole en Europe". Les services de vulgarisation agricole participent au Système de la Connaissance de l'Agriculture (SCA), qui contient aussi la recherche agronomique et l'éducation supérieure. La vulgarisation agricole transfère aux agriculteurs les informations sur les innovations technologiques et de gestion et, au par ailleurs, la demande d'innovation à la recherche agronomique et aux écoles supérieures d'agriculture, agissant de telle façon qu'elle peut jouer une double rôle de "pivot" : l'un à l'intérieur de l'organisation de la filière agricole et du monde rural et l'autre aux fins de la co-évolution des systèmes naturels and sociaux. On doit réaliser un effort pour mieux mettre en liaison les sciences naturelles et sociales afin d'expliquer le jeu de l'évolution qui se passe à l'intérieur de l'hypothèse "Gaia". Cet effort est possible avec des modèles dans lesquels on utilise d'une façon similaire le paradigme qui contient l'information, l'organisation, le changement et l'évolution. L'information qui est importante pour la vie biologique et sociale en général et, en particulier, la connaissance qui est accumulée dans le "capital humain" sont les mots-clés qui peuvent créer une liaison étroite afin d'expliquer la co-évolution naturelle et sociale. Les services de vulgarisation agricole travaillent dans le point de la "spirale de la connaissance" où la connaissance explicite et codifiée du personnel scientifique est convertie en connaissance tacite et contextuelle des agriculteurs, donnant aux agriculteurs une aide directe dans leurs choix, avec la possibilité d'accroître leur pouvoir contractuel à l'égard des autres secteurs économiques, et indirecte comme un puissant facteur de croissance du SCA. Les services de vulgarisation montrent empiriquement une forme évolutive, qui est liée au changement technologique et à l'évolution sociale, à son tour liée aux stades de développement économique. Les pays développés sont en train de discuter si le SCA est encore important pour des sociétés riches : la conférence de l'OCDE de 1995 à Paris a répondu que la qualité et la santé des aliments, le futur du monde rural, la conservation de l'environnement et la durabilité du développement économique sont des buts qui demandent un fort SCA également dans les pays développés. Pendant le troisième millénaire les services de vulgarisation agricole auront le devoir de gérer la co-évolution naturelle et sociale de telle façon que la vitesse du développent économique ne puisse pas détruire la capacité de l'évolution naturelle et sociale d'exister l'une proche de l'autre.*

Mots-clés : *Information, organisation, changement, évolution, vulgarisation, "monde" rural, hypothèse "Gaia".*

Introduction

The agricultural extension services belong to a more large Agricultural Knowledge System (AKS), that also comprehends the research and the high education. On its whole the AKS produces, adapts and transfers the agricultural technological and managerial innovations. The technological and managerial innovations change the agriculture and promote the economic evolution of the social systems, that in its turn stimulates the evolution of all the AKS' activities.

Agricultural extension services transmit informations on the new technologies and managerial solutions from the research and high education to the farms, with the aim to improve the farmers' decision capability and their contractual power. Services also translate the innovation's demand from farmers to research and high education, thus playing a "pivot" function, inside the AKS.

Extension services, a major trait of the agriculture's civilization, are important by another point of view. Being the agriculture at natural and social systems' boundaries, more or less consciously the services master two kinds of knowledge: the one upon the living systems, with a special reference to the information stored in the genetic codes, and the other on the social systems, with a special reference to the information stored in the economic organizations. Mastering knowledge both on natural and social side, the agricultural extension services master the co-evolution of the environment and the human society, in developed and developing countries, thus playing another "pivot" function, inside the "Gaia" hypothesis.

Information, organization, change and evolution are the key-words that the paper will carefully regard. Since agricultural services border at the society and environment's boundaries, the paper will try to cross the frontiers among the natural and economic sciences. As physics, at very more little scale also farm economics needs a General Unified Theory, that lets us explain the natural and social systems' co-evolution by a sole theoretical paradigm, starting from which a set of models could be developed, all of these being based on similar frameworks that link information, organization, change and evolution.

Information, organization, change and evolution

Information and organization

Information and organization in the natural and social systems

A system is a set of interacting elements. The system's elements are connected to each other by some special relations, that are different from those the system's elements have with the external ones. The elements' interaction determines the system's properties, as totality, centralization, finality, equifinality, homeostasis, feed-back, growth and competition.

Natural and social systems are complex systems whose functions cannot be reduced to the mechanical scheme of a close physical system, that follows deterministic laws and aims at a thermodynamic equilibrium, which is reached when the entropy is at the top. Entropy means randomness, or disorder, while negative entropy, or negentropy, means order: since the information reduces the uncertainty and *"uncertainty and entropy are identical"* (Ayres, 1994), negentropy, order and information are positively correlated notions.

Natural and social systems are open systems which contain negentropy, order and information not aiming at a thermodynamic equilibrium, but at a steady state, that is *"a temporary condition of constancy of some subsystem variables"* (Ayres, 1994). Natural and social systems are not casual combinations of elements, or organizations, whose order (steady state) depends on the information (negentropy) and whose complexity is growing according to the increase of the system's information (negentropy). In physic open systems the steady state is maintained by fit mechanisms, that captures external energies and are regulated by some tool where a simple information is stored. In natural open systems as living organisms, steady state is maintained by means of metabolic processes that capture external energies (solar radiations directly exploited by plants or indirectly, through organic materials, by animals), being regulated by the genetic codes where a very sophisticated information is stored.

A whole of living organisms is an ecosystem, *"a self-organizing and persistent collection of interacting populations occupying the same territory, not necessarily stable or homeostatic, since exhibits a life cycle and a developmental character"* (Ayres, 1994). The ecosystem is a complex, open, self-organized and ordered system, that maintains its steady stade through biological, self-regulative, homeostatic mechanisms and increases its complexity through biological, heterostatic, growing processes. The biosphere is the Earth seen as an unique ecosystem.

The social system is a modified or built ecosystem, including men, living organisms, natural resources and manufactured goods, both in use and discarted, produced by the *"industrial metabolism"* (Ayres, 1994). The social system is a complex, open, self-organized, ordered system, that maintains its steady state through social, self-regulative, homeostatic mechanisms and increases its complexity through social, heterostatic, growing processes. For maintaining the social system's steady state and/or increasing the social system's complexity the economic processes have the task to transform the natural material resources and energies in economic goods, that have a greater utility for man: the transformation of natural resources and energies into economic goods needs social and economic institutions and organizations, where very sophisticated informations are stored (knowledges, technologies, laws, routines and so on). An economic organization needs a hierarchy, that must govern it on the ground of the social institutions. The hierarchy's performance depends upon the capability of the communication channels: the economic organizations growth falls in when some communication's boundary arises. The anthroposphfere (noosphere, according to Teilhard de Chardin) is the humanity seen as an unique social system.

Already advanced in the far 1785 by the geologist-physician Hutton, the "Gaia" hypothesis has been proposed again by atmospheric scientist Lovelock, who supposes that atmosphere, geosphere, idrosphere, biosphere and anthroposphere form a whole living system, that actively maintains the life's conditions in our Planet.

The anthroposphere adds to the biosphere's negentropy the social information. Information is commonly used: *(i) "in the semantic sense (as "data"); (ii) in the pragmatic sense of "knowledge"; and (iii) in a formal technical sense as the resolution of doubt or uncertainty"* (Ayres, 1994). The third kind of information is shared in D-information and SR-information. D-information is the a priori probability function of a given state, among the universe of all possible ones, and it is relevant both in physics and in biology; SR-information is relevant only for the living organisms and social systems and it is shared in two sub-categories: *(i) "useful information (SU-information), or information without further qualification; and (ii) harmful information (SH-information), equated to erroneous information, or misinformation, as well as intentional deception, or disinformation"* (Ayres, 1994)[†].

Information and organization in the economic systems

The economic system is the set of human activities devoted to production, exchange and consumption of goods with the aim to maintain the steady state and/or to increase the complexity of the social system. Despite the large consensus on the economic system's objectives (the allocation of the scarce substitutional resources among alternative ordinal goals), the economists have different ideas about the ways that the economic system utilizes to reach these objectives.

The classic economics regards the *"market's invisible hand"* as a fit mechanism to improve the *"wealth of the nations"* (Smith, 1776). This theory also regards the economic system as a flow of material goods which tends to reach a steady state, that is obtained when all the resources, worn-out by the production processes, are restored: according to Sraffa the classic economics regards to the economic system as a circular *"production of goods by means of goods"* (Sraffa, 1970).

[†] *"Usefulness or harmfulness as applied to SR-information is definible in terms of a specific local reference system... In biological systems, useful information, content of genes, is defined in reference to organism itself: it is the architectural information needed to specify the physical and chemical structure of functional cell, as well as the procedural know-how to built it, while harmful information subcategory comprises those genetic variants that result in impaired functions"* (Ayres, 1994). In social systems useful information, content of institutions, is defined with regard to the information needful to specify organization's structure, as well as the procedural know-how to built and manage it, while *"harmful information takes the form of defective product design, defective materials, erroneous communications or data, and anything that results in avoidable costs for inspection, repair or maintenance, recovery for accidental loss and destruction"* (Ayres, 1994).

The neoclassic economics, born from the classic one, is devoted to the market's explanation through the consumers and producers behaviour's analyse. Since neoclassic theory postulate that both of them choose in a perfect knowledge state and try to maximize one's own goals, the individual best performances selected by the market's competition lead the economic system to an equilibrium, which is far from a steady state and near to a mechanical equilibrium's reversible state. An important corollary of the neoclassic theory is that the economic equilibrium also maximizes the social welfare.

According to neoinstitutional theory, a more modern version of neoclassic economics, D-information is a free good, while SR-information, as a tool for the economic organizations' survival, is ever an economic one. Actively selected from the D-formation flows, SR-information is actively transformed in knowledge through the individual and/or social learning processes. The usefulness of information is measured in a qualitative or quantitative way: the one is an innovative knowledge when it is produced *"by the engagement and the convincement of who will keep it"* (Nonaka, 1994); the other is a recognized knowledge when it is spreaded among many utilizers[†].

In spite of lack of the fundamental criteria to differentiate the economic usefulness and harmless of SR-information and to evaluate these attributes in an economic way (utility, price and cost), the neoinstitutional economics thinks that the protection of the rights of the knowledge's ownership forms (informs) the *"efficient boundary"* (Williamson, 1985) between the organization and market. Neoinstitutional economics does not attack the neoclassic paradigm's heart -that is the analyse of producers and consumers' behaviours- but only its *"protection belt"* -that is the perfect knowledge's conditions. SR-information having a cost, the enterprise's goal is not the maximum revenue, but a satisfactory one: when an added information's cost is higher than the expected revenue increase, the research of SR-information is cutted off. So enterpriser does not choose in an absolute rationality state, but in a *"bounded rationality"* (Simon, 1979) one.

The evolutionary economics considers the social institutions to explain the economic phenomenons. Institution is a *"relatively coherent and efficacious set of rules socially shared"* (Parri, 1996), social *"rules of game"* being *"the boundaries that men have setted for regulating their relations"* (North, 1990). As well as DNA's information governs the living organisms, the social institution's information govern the economic organizations and, like the DNA's mutation promotes the biological evolution, the change in social institutions promotes the economic evolution. Hypothesizing that the economic systems are similar to natural ones and social rules (institutions) to genetic codes, the evolutionary economics hard attacks the neoclassical paradigm's heart.

The formal laws are the regulative rules which give to each individual the capability to reach his goals inside the market; the customary informal behaviours are the constitutive rules which give to each individual the capability to solve the bargaining conflicts inside an organization. Market is a regulative rules institution that relies upon the quantity-value (tacit, implicit, empiric) knowledge; hierarchical organization is a constitutive rules institution that relies both on the managers' quality-value (codified, explicit, academic) knowledge and on the skilled workmen's (tacit, implicit, empiric) one.

The knowledge does not produce the economic equilibrium, but an economic order. The economic order is a steady state that is far from the economic equilibrium, since order is a constancy of some set of social relations which may persist in many different equilibrium's conditions and also during the economic change or development. There are two kinds of economic order: the organizations *"delivered order"*, that Hayek, as the ancient Greeks, names *"taxis"*, and the market's *"spontaneous order"*, that Hayek himself, as the ancient Greeks, names *"cosmos"* (Hayek, 1983). Organization (delivered order) and market (spontaneous order) are two alternative ways to solve the co-ordination of the economic activities. None of them is the best. If the objectives are few and a hierarchical order of goals is arranged, organization is a powerful tool to reach an efficient economic co-ordination; if the economic system's complexity is so high that it cannot understood and controlled by an individual, the efficient co-ordination of economic activities is getted only by the spontaneous order of the market.

[†]An increase in quality-value knowledge *"...leaving quantity unchanged, can benefit society, irrespective of ownership: the acquisition of extra copies of the added quality-value of SU-information or knowledge (by other firms), disregarding acquisition, retrieval, or decoding costs, is balanced by the competitive loss of the original discoverer"* (Ayres, 1994); if a piece of quantity-value knowledge is acquired, *"the aggregate socio-economic value of SU-information or knowledge is an increasing function of the number of copies that exist (i.e., the number of people who have it): examples might include, at individual level, knowledge how to avoid infection by AIDS virus and (at farm level) how to make farmland more productive"* (Ayres, 1994).

Spontaneous and delivered order always coexist in every economic system, since the organizations (firms, associations and public administrations) live all together in a market's economy. Hayek names the market *"katallaxia"*, according to the Greek term whose meaning is *"to admit someone into a community"* and *"to change someone from an enemy to a friend"* (Hayek, 1983). Market is not only the field of competition, or negative reciprocity (opportunism), but it is also the field of collaboration, or positive reciprocity (loyalty). Since *"reciprocal altruism"* is the basic feature of a *"civil society"* (Zamagni, 1995), market really functions as a good co-ordination tool of economic activities only in a civil society.

In a sense the evolutionary economics returns to the classic one: the circulation of goods starts from the consumer and producer's knowledge and, since economic agents do not choose in perfect knowledge state, a new knowledge derives from the goods' exchange. At the beginning of the economic cycle the knowledge forms (informs) the economic system; at the end, the production, exchange and consumption of goods form (inform) a new knowledge. According to the evolutionary economics, and paraphrasing Sraffa, the economic system is *"production of goods by means of knowledge and production of knowledge by means of goods"*.

Information and organization in the agrarian and rural systems

Agriculture is the set of the economic activities that man has exploited to take a larger advantage from the biosphere's material resources, energy and information, and the first invasive anthroposphere's structure that man has layed upon the biosphere, having the agriculture formed (informed) the tilled soils and the agricultural plants and animals' genetic codes. Last but not least, agriculture has improved the social systems evolution, starting from the first paysants villages and towns and from the ancient regimes' institutions, where the writing was invented by the scribes, the first agrarian managers (the forefathers of the modern agrarian advisers).

As enterpriser, the farmer does not choose in a absolute rationality state, but in a *"bounded rationality"* context, so that the farm's organization is a reaction to the uncertainty's conditions. Yet, normally having the farm a small scale organization, farmer rarely employs a staffing personnel to manage (programme, plan and control) all the farm's activities and needs the support of the agricultural extension services.

The extension services partake a more large rural system. By a geographic side, rural system is a balanced mix of environment, rural population and agrarian and other economic activities; by a social and economic side, rural system is a society that has the goal to preserve the natural resources' fecundity, that is a *"communitary system of collectively organized resources"* led on by a *"community of interests"* to improve *"the management and the common defence of resources"* (Bourbouze and Rubino, 1992).

The rural system is a successful solution to harmonize natural and social systems. In the far past the rural society was only an organized system; in the near past the rural society has been broken by the market economy; nowadays, the global market's increasing importance destroys the rural society in developing countries, but paradoxically stimulates a new interest towards the so-called "rural world" in developed ones. The rural world contains farms and extension services, industrial and commercial firms, local communities and public administrations and it is named *"agro-industrial district"* (Iacoponi, 1990) or *"rural industrial district"* (Lowe *et al.*, 1995).

The agro-industrial or rural industrial district's definition is born from the industrial "tout-court" older one: the industrial district is a *"N-form organization"* (Belussi, 1995), where the information and the communication technologies of the third industrial revolution allows the small scale firms to be efficient as the big scale hierarchical ones, by means of many vertical, horizontal and diagonal relations, inside a local economic system. The industrial district is a network of relations among local social and economic actors and, being intermediate between organization and market, it is named a *"quasi-market"* (Iacoponi, 1990) or *"quasi-organization"* (Benvenuti, 1989) system.

The rural industrial district's common market outlets, common storage and transformation plants, common information sources or extension services become real external economies for every farm when the local economic system is established as communitary market, which knocks down the transaction costs, and as industrial or *"technological"* (Iacoponi, 1990) atmosphere, which knocks

down the SR-information costs: communitary market and technological atmosphere allow both the competition and the collaboration among the rural industrial district's actors to co-exist, being the competition and the collaboration born from the social relations' tikness inside the local community. In a rural industrial district the negative reciprocity (opportunism) is restrained by a positive reciprocity (altruism), that is a persistent rural society's "genetic code", being the rural institutions the historic product of a specific collective learning process that aims to preserve the local natural and social resources[†].

In the rural district's learning process the conversion of the codified knowledge in a contextual one is performed by some particular agents, the *"versatile integrators"* (Becattini, 1994), who work in that point of the *"knowledge spiral"* (Nonaka, 1994) where the scientific *"high knowledge"* is integrated into the empirical *"low knowledge"*: versatile integrators *"attend to the 'dirty' phases where something we cannot well define must be integrated with something we can well demarcate, according to 'a priori' not definable procedures"* (Becattini, 1994).

The agricultural extension services are the knowledge's versatile integrators that transfer from AKS to farmers and vice versa the SR-information, both at quantitative and qualitative level, to enlarge the farmers' decision ability and their contractual power against the major agribusiness' companies, to promote the farming's integration inside the agribusiness system and to develop the rural communities inside a global society.

The agricultural services system are generic and specific: the generic services concern the agriculture in its whole (experimental stations, information networks, advisers formation schools); the specific ones are direct (individual) and indirect (collective): the directs services regard the technical, commercial and financial advices; the indirect ones regard the professional formation and the agro-chemical laboratories, the agro-meteorological stations, the socio-economic information or rural animation and so on. The agricultural extension services also translate from farmers to the research and high education institutes the innovation demand, thus playing a "pivot" function inside the AKS' *"knowledge spiral"*.

Change and evolution

Change and evolution in the natural and social systems

The history of a species is a phylogenetic evolution; the life cycle of an individual is an ontogenetic one. Phylogenetic evolution is in biology the Lamarckian evolution of a species and in economy the historical evolution of an economic system. Ontogenic evolution is in astrophysics the life cycle of a stars, in ecology the life cycle of an ecosystem, in economy the life cycle of a firm-farm or of an industrial rural district.

Natural and social evolution select the successful solutions through myopic and presbiopic mechanisms. Myopia is a synonymous of the selfishness and presbyopia, or far-sightedness, of the altruism. In biology there are relevant examples of presbyopia[††]. A strict parallelism there is among

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[†] *"Every local system realizes the integration among explicit (codified) and implicit (tacit) knowledge. The modern industrial civilization stands upon an incessant process of conversion of codified knowledge in contextual one, and vice versa. The knowledge used in the production is not a fixed datum but it is continuously elaborated and increased by the learning processes, some of which have local nature and other are less linked to places where knowledge has been firstly produced and utilized"* (Becattini and Rullani, 1993).

[††] The appearance of the eukaryotes (cells with true nuclei) is an evenement in biological evolution: according to Margulis, *"...the cellular nuclei were originally independent organisms (bacteria) that were either ingested by prokaryotes or invaded them and evolved a symbiotic relationship. Eucaryotes organisms differ from their predecessors in having a specilized information storage and processing centre, the nucleus. Free of the need to carry out other functions, it was able to specialize more effectively on this one particular function. The specialized gene-carrying nucleus opened the way to sexual reproduction... Eukaryotes were followed by the first truly multi-cell organism...* (and) *this was almost certainly another and more complex form of merger of eukaryotes working and reproducing together as unit. Probably the earliest multi-cellar organism evolved from successful symbiosis... symbiotic cooperation between photosynthesizers and nitrogen-fixing or other concentrate bacteria could have evolved into the multi-celled plants. The net effect of the advent of multi-cellar organisms seems to have been an increase in the efficiency of the organism and its ability to compete and survive"* (Ayres, 1994).

prokaryotes and small scale firms, both of them being deprived of an efficient *"information storage and processing centre"* (Ayres, 1994) and among the cellular nucleus and the extension services too. We can equate eukaryotes' *"symbiotic cooperation"* to that among the farms and the extension services since, like *"knowledge-carrying nuclei"* the extension services *"are specialized more effectively on this particular function"* (Ayres, 1994). A strict parallelism there is also among the multi-cellar organisms and the rural industrial districts, since a district *"seems to have been an increase in the efficiency of the organism and its ability to compete and survive"* (Ayres, 1994).

The main factor in biological and social system's evolution is the change in the intelligence's level[†]. Even if intelligence tends to lead the social systems' evolution towards a positive reciprocity, or altruism -*"one of the major puzzles of evolutionary biology"* (Ayres, 1994)- the social systems' evolution strongly conflicts with the natural systems' one, since *"the most significant contribution of humans to biological evolution is probably that humans have, in fundamental ways, changed the rules of evolutionary game itself"* (Ayres, 1994)[††].

Change and evolution in the economic systems

The economic evolution crosses through the *"development stages"* (Rostow, 1960): (i) primitive society; (ii) traditional society; (iii) transaction society; (iv) industrial take-off society; (v) industrial mature society; (vi) industrial affluent society; and (vii) global society (the first and the seventh stages are added to the original Rostow's scheme). In a primitive society, that lives at the survival malthusian bounds by means of a hunting technology, the agriculture is unknown. The birth of the agriculture leads the society to a traditional stage, where the survival bounds are enlarged by the new agricultural technologies. The traditional society goes towards a transition stage when the agriculture is reinforced in such a way that the capital accumulation enables the landlords to invest in more profitable manufacturing activities (first industrial revolution): the transfer of the social leadership from agriculture to industry induces a deep change in traditional society's organizations and institutions. The fully spreading of the first industrial revolution induces the economy's take-off and the birth of a "big" society, as well as foreseen by Adam Smith's classic thought. The second industrial revolution, that is the assembling-chain ("fordist") innovation, promotes an affluent society, where a large consumption of goods touches all the social classes. The informatic and logistic ("toytist") technology of the third industrial revolution stimulates a global society, whose world-wide economy is favoured by the international trades and the transnational industries and by similar production and consumption's behaviours, connected to similar life's standards, languages or communication's codes.

As well as the economic steady state is a knowledge's product, the evolutionary economics hypothesizes that the steady state's breakage is the consequence of a knowledge's change, starting from which the social system have at its disposal: (i) new products; (ii) new production processes; (iii) new raw materials sources; and (iv) new market and organization's institutions. Steady state breakage is the change's impulse that marchs off the social system's evolution but the economic development arises if a human capital accumulation takes place: *"innovation is a form of organized knowledge creation... a process by which the organization creates and defines the problems, actively developing new informations to solve them"* (Nonaka, 1994). During a social system's evolution human capital accumulation starts from a local, tacit, empiric, contextual knowledge and goes towards an integrated one, that increases the knowledge's spiral as the result of learning processes that

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[†] *"Intelligence comes in various degrees. Mild forms include learning from experience, learning by imitation, tool-using behaviour, and verbal communication. Written communication, abstract thought, and certain other types of organized social behaviour appear to be unique to humans"* (Ayres, 1994).

[††] An example of the evolutionary game's change is the extraordinary progress in genetics, during the last forty years. *"By the middle 50's, a first escape... from the prison of sexual reproduction was called by Haldane 'Alternative to sex'... About that time the techniques of fusion animal cultured cells were beginning to be developed. Plant cultured cell fusion came a few years later... Within a few years the progress became enormous; in 1968 there was not a single human autosomal gene the chromosomal assignment of which was known, now the are hundred... in the 70's to 80's... we had the... spectacular growth of molecular biology (and) the genetic material can be transferred between all living organisms by a variety of processes, of which sexual reproduction, retrovirus transmission and artificial transfection are examples... We come to the conclusion that the whole biosphere of this planet shares a common gene pool... Now we are free of the latter limitation; we can transfer DNA of one organism to another irrespective of whether sexual reproduction is possible between them... A trend in molecular biology is perfectionism. Genes are cloned, sequenced and the transferred with as precise a knowledge as possible of what each does... Fundamentally, natural and artificial selection have done this for age. We have now new tools for increasing genetic variation, and applying selection on it."* (Pontecorvo, 1992).

strictly link local and global, tacit and explicit, scientific and empiric, codified and contextual knowledge.

A *"technological paradigm"* is born from an integrated knowledge, as a set of thoughts and behaviours that master a given technology, inside a *"technological trajectory"* (Dosi, 1988). A technological paradigm comprehends the innovation's demand and the scientifical principles, empirical procedures and practical behaviours (heuristics) to supply this demand. A technological paradigm is a *"fit scheme for the solution of selected technical economic problems, according to highly selected principles of natural sciences"* (Dosi, 1988) and includes a prototypes' collection and all intuitive solutions to develop new products or new production processes. An invention can arise from a new technological paradigm, whose new technological trajectory may transform an invention in a radical innovation, after having tested it *"upon the trial bench of the cost, or sifted by prices"* (Hicks, 1973).

A new technological paradigm, that stimulates a radical innovations, springs up in a society's crucible, where many persons are working in a collaborative way inside public research centres, experimental stations, universities, high schools, corporations' R&D divisions and innovative little-middle scale firms. Radical innovations lives many times side by side with an old technology's life cycle. Radical innovation deeply change the social systems' economic organizations and promotes the social evolution, but a social change is seen by people with a suspicious glance, people being not sure that a social change could be a "human development". Radical innovations induce a social evolution's trend rupture and people need a social "try and error" process, so that a social change could be acceptable. The people's acceptance of a new paradigm and of a radical innovation is showed by the increasing of tacit knowledge in market producers and consumers' behaviours (if market's competition is not bankrupt).

The judgement about an economic change, mainly when the consequences of a radical innovation must be accounted for, needs new fit economic measure tools, that look at social welfare. Social welfare may be seen as standard of living and *"the standard of living* (is) *really a matter of functionings and capabilities, and not a matter directly of opulence, commodities or utilities"* (Sen, 1987): functionings are the styles of life people really lead and capabilities how many degrees of freedom people have to lead it. The standard of living stands upon a civil society, where a reciprocal altruism supports the market competition by means of a *"major trust or a better trust's expectation"* (Zamagni, 1995). To improve the social welfare the economic development must be sustainable: sustainability needs collaborative behaviours not only inside the present generation, but also among the present and future generations, so that *"the well-being of today's generation should not be increased at the expense of future generations"* (Pearce *et al.*, 1989). More generally the sustainability of economic development needs the collaborative and presbiotic behaviours between social systems (anthroposphere) and natural systems (biosphere), inside the whole "Gaia" system.

Change and evolution in the agrarian and rural system

The technical progress of agriculture can be stylezed in a innovations' continuum that crosses all the phases of the agriculture's evolution, with a connection to the shift from a society's stage to another. The primitive society ends when the first mono-cultures and breedings technologies of a subsistence agriculture substitute the hunting technology and promote a traditional (rural) society. The traditional society is linked to the classic (or traditional) agriculture, whose main innovations are the space-time shift of cultures (rotation) and the linkage between cultures and breedings to exploit the organic fertilization of soil. The traditional society passes to a transition one when the farmers utilize more intensive industrial inputs, which increase the yields but cut off the linkages between agriculture and ecosystems. The "wheel of the agriculture's technical progress" shows five future scenarios: (i) soil-less and biotechnological agriculture that induce further breakages both inside agriculture (of cultures-breadings linkages) and between agriculture and ecosystems; (ii) extensive agriculture, with a return to the subsistence agriculture's mono-culture, an anteroom of the land's abandon; (iii) high quality agriculture that maintains the typical local products and the traditional processes; (iv) sustainable agriculture, a systematic agriculture's renewal; and (v) organic farming, a sustainable agriculture's more heroic scenario (Fig. 1).

The "wheel of the agriculture organization" is parallel to that of the technical progress. The peasant village is a typical rural institution and organization in a subsistence agriculture. The family-farms or more complex agreements among landlords and peasants are the main institutions and organizations

during the classic agriculture. The hierarchical organized farms, including plants, machines and management staff, is the arrival point of the farm organization in a technological agriculture. Also the "wheel of the agriculture organization" shows five future scenarios, according to the ones of the wheel of technical progress: (i) industrial plant in soil-less and biotechnological agriculture (greenhouse cultures and intensive breedings); (ii) structureless farm in extensive agriculture; (iii) agro-industrial district in high quality agriculture; (iv) rural industrial district in sustainable agriculture; and (v) renewed family-farm in organic farming (Fig. 2).

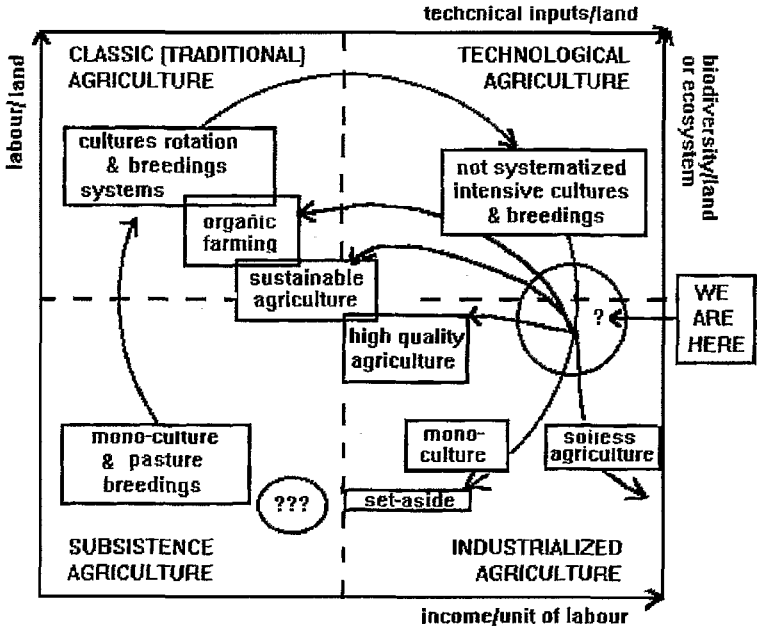

Fig. 1. The "wheel of the agriculture's technical progress": Five future scenarios.

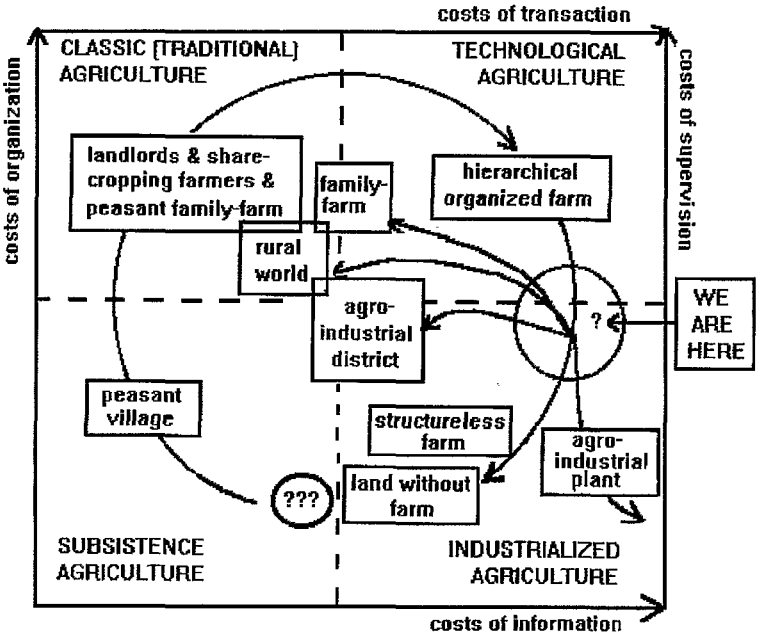

Fig. 2. The "wheel of the agriculture organization": Five future scenarios.

In the spiral function of the agrarian organizations, a special role is played by the extension services. The "wheel of the extension services" shows that in the subsistence and classic agriculture there are not services, being the information an empiric tool, supported by farmers' experience, imitation, tool-using behaviours and verbal communications. In the sunset of the classic agriculture, the extension services first generation (farmers' information and education) is supplied by the state to induce the agriculture's technical take-off. Shifting from the classic to technological agriculture the public services' second generation (research, experimental stations, advice services, etc.) is established to promote a more industrialized agriculture. Shifting from a technological to an industrialized agriculture, the professional services first generation not only takes the place of public services first one, but also enriches the whole services' organization by means of specific professional services, as fiscal and social provision patronage, commercial and financial advice and so on. The "wheel of the extension services" also shows five future scenarios, according to technical and organizational wheels: (i) industrial advice services for soil-less or biotechnological plants; (ii) external private agencies for extensive structureless farms; (iii) support services (market information, chemical laboratories, meteorological stations, etc.) for high quality agriculture; (iv) environmental advice and/or rural animation for sustainable agriculture; and (v) balanced mix between the sustainable agriculture services and the farmers' tacit experiences for organic farming (Fig. 3).

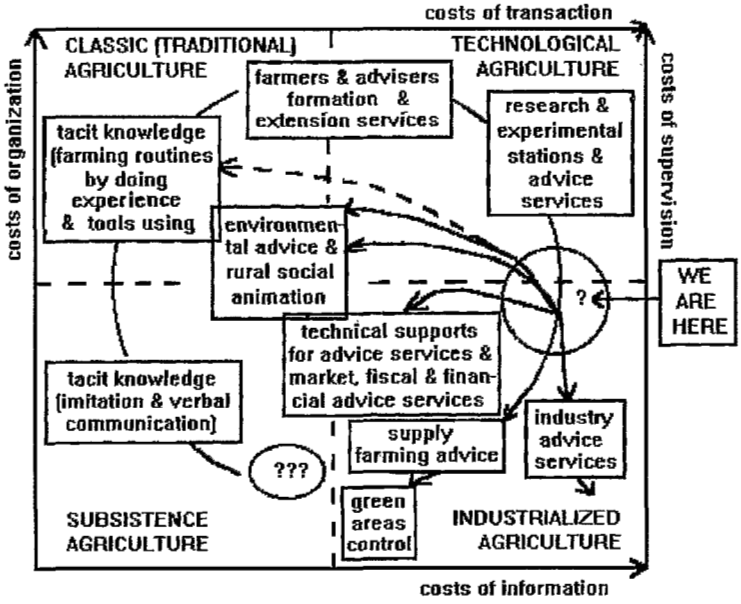

Fig. 3. The "wheel of the extension services": Five future scenarios.

The symbiotic cooperation among farmers and extension services is a big innovation in the organization of the agriculture: the double level of collaboration (among farmers and extension services and between the whole of the services and the rural industrial district) has increased the complexity and stimulated the creative capabilities of the rural networks, where a reciprocal altruism has amplified the trust, thus opening new fields to the collaborative decision making processes and collective enterpriser's strategies, both in the time's dimension (short *vs* long period) and in the space's one (local *vs* global market).

The evolution of agriculture is a successful solution that depends on the presbiopic behaviours of farmers and advisers, whose symbiotic cooperation stimulates the development of the knowledge and the altruistic reciprocity in the whole rural society. The technical progress of the agriculture is a process of internalization of the research institutes and experimental stations' explicit knowledge into the farmers' tacit one, through the mediation of rural district's networks. In default of a strong rural network, extension services can lead the agriculture change towards an exogenous development, while the presence of the communitary market and technological atmosphere of the rural district, can lead the agriculture technical change towards an endogenous one. Endogenous development is a

self-centred conservative process of growth which *"utilizes locally developed techniques, experiences and knowledges on the conversion of local available resources into locally specific products"* (Long and van der Ploeg, 1994). *"Endogenous development includes: (i) the local determination of development options; (ii) the local control over the development process; and (iii) the retention of the benefits of development within the locale. Endogenous development is locally determined and respects local values, while exogenous one is externally determined and tends to trample over local values"* (Slee, 1992).

The core of the endogenous development is the endogenous production of innovations, by means of specific knowledge processes as *"learning by doing"* (Solow, 1992), *"learning by using"* (Dosi, 1988) and *"learning by monotoring"* (Belussi, 1995). Endogenous development is possible when a growing quantity of goods is produced by means of technologies that become efficient when the information is deliberately accumulated and improved by the economic agents in a local system. In a rural industrial district the growth of the quantity of goods is not only strictly linked to the diffusion of the quantity-value informations through the market competition but also to the increase of the quality-value innovative knowledge, inside a local system's organization[†]. The endogenous innovations depend on special resources, as *"particular labour categories"* or *"human capital particular species"* (Solow, 1992), that is on the human capital quota that intends to new products or new production processes' research. The human capital quota is different from zero if the total human population does not go down at a too low level in a rural territory.

Rural development is an endogenous development that aims at social welfare. As social welfare has not, or not only, the goal of growth of the opulence, but also those of a better standard of living and of a social evolution which preserve the natural system's one, the rural development must be a "conservative change" process of the agriculture and of the other economic rural activities. A "conservative change" may literally appear a nonsense, but it is not a strange kind of economic development. As the *"development is sure where societal past is vibrant and strong"*, the neoclassical economist Marshall forebodes a *"conservative capitalism"* and regard *"the conservatism of custom and the mutability of capitalism as standing to one another in the same relationship as the upper and the lower blades of a scissors."* (Reisman, 1992)[††].

In rural development's "conservative change" agricultural extension services play a "pivot" function also in regard of the natural and social co-evolution, as predicted by the "Gaia" hypothesis.

Service organization and evolution

Extension services organization and evolution in Europe

An inquiry (Commission des Communautés Européennes, 1990) has analysed the organization of the agricultural extension services in some European regions or districts (Zuid Holland in the Netherlands; Manche, Loire, Loire et Cher, Tarn et Garonne in France; Palermo, Salerno and Modena in Italy; Catalonia in Spain; Phthiotis, Corinthe in Greece). The enquiry empirically shows that extension services organization has evolutionary trends. The services' organization is clearly linked to the agriculture evolutionary phases. In South Europe the extension services' organization is linked to the classical (traditional) agriculture or to a transitional one. In Phthiotis and Corinthe districts private agencies and first generation of public services are meeting the farmers' needs of extension. Also in Palermo and Salerno provinces and in Catalonia region, the extension services demand is only covered by the first generation of public services. In French districts, whose agriculture is at the top of the technological phase, extension services are organized by the agrarian syndicates. The Modena province services' organization is intermediate between French model and the Dutch one: in Zuid Holland a very industrialized agriculture requests a second generation of public services (as research and technological supports), that lives in a symbiotic co-operation with the second generation of professional ones, mainly in the commercial and financial fields (Fig. 4).

[†] *"Many local contexts are learning laboratory where new varieties are experimented, selected and stored... local system... is a place of accumulation of production and life experiences and a place of new knowledge production and these are really the critical resources of contemporary capitalis development."* (Becattini and Rullani, 1993).

[††] Marshall himself is conscious that market competition is an *"ordeal of economic freedom"* (Marshall, 1949), since, if *"some competition is an essential stimulus of many forms of activity, competition turned malign can become a species of warfare, in which every man's hand must be against hid neighbour"* (Marshall, 1925).

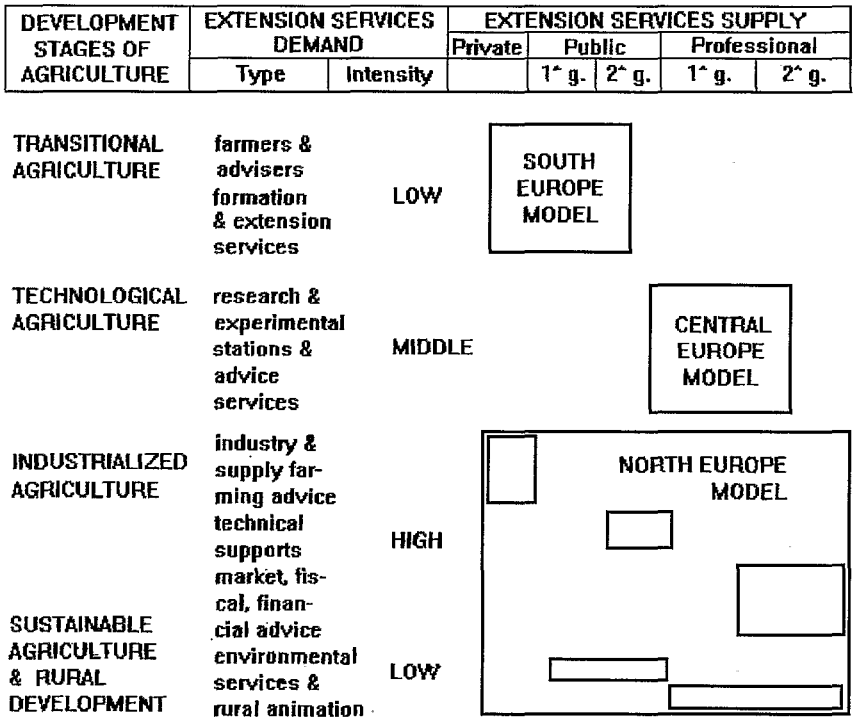

Fig. 4. Organization models of the agricultural extension services in some European regions or districts.

An evolutionary economic law explains the empirical evidences of the trends in the extension services' organization. Each stage of the agriculture is promoted by the innovations stimulated by the former stage's knowledge. The extension services have two tasks: (i) the diffusion among all farmers of the quantity-value knowledge (consolidated technologies); and (ii) the maintenance of "learning by doing", "learning by using" or "learning by monotoring" processes inside the innovative farms to improve the quality-value knowledge's increase (innovative technologies). Farmers' demand of the extension services concerns the first kind of knowledge and the public services supply this demand at the beginning of the agriculture's technological evolution, when no previous innovations are available. The professional services come in at a second time to favour the following stages of agriculture technical change. The services' demand to improve human capital into a rural industrial district is latent and is recognized as important only by the public autorithies (rarely by the professional syndicates). Market never takes the place of extension services in the quality-value knowledge's production: market is a powerful source of quantity-value knowledge, even if the market failure requests a substitution of market by public or professional extension services. The quality-value knowledge is the engine of the economic change and of the social evolution but quality-value knowledge is a successful result of the symbiotic cooperation among farmers and advisers, whose presbiotic mechanisms live in the social altruistic behaviours of an industrial rural district's context. According to the evolutionary economic law of services organization, we can say that the *"invisible hand of market"* is a tool for the selection of the best technical and organizational solutions, but it leads only to a temporary steady state, which is always overturned by the technological change, promoted by the *"visible hand of knowledge"*.

Agriculture knowledge system's world-wide organization and evolution

A window about the future of extension services in the developed countries' agriculture has been the International Conference, appointed in Paris during the year 1995 by the Organization for Economic Cooperation and Development (OECD). The international dimension helps us to appreciate Agricultural Knowledge System (AKS) -the whole of agricultural research, high education and

extension services- as a rural patrimony, at national, regional and local level, and as the engine of future agriculture's evolutionary scenarios in the developed countries and in the developing ones.

The developed countries' engagement in AKS' staff and financial cost is very high[†]. Comparing the major world's economic systems (EU, NAFTA and Japan), we see that EU, save Great Britain and Ireland, is the continental area where works the bigger AKS staff (78,000 persons in EU, 65,000 in NAFTA, 38,000 in Japan), but NAFTA spends a bigger amount of money (10,000 M$), followed by EU and Japan (8,000 and 2,300 M$ respectively). The agricultural research in OECD countries concern about 500 public or private institutions, half of which in the NAFTA's countries, mainly in USA. Students in agrarian high education institutes are in USA 104,000 under-graduates, 14,000 graduates and 10,500 post-graduates; in Canada 1,700 under-graduates, 460 graduates and 155 post-graduates; in Japan 2,770 graduates and 730 post-graduates. Quitting the under-graduates, Europe's graduates students in agriculture are about 9,200, that is two third of USA's ones, and the post-graduates students are about 1,000, that is, save Great Britain and Ireland, less than one tenth of the USA ones[††].

Declining studies in agricultural sciences are the traditional areas, both in vegetal and animal production. The animal production sciences degrees was in the States 3,500 in 1987 and 2,500 in 1991; in the same time vegetal production sciences degrees declined from 2,700 to 1,800; parallely in the natural resources sciences degrees was 3,000 per year. In the Netherlands graduates in vegetal production declined from 150 in 1987 to 82 in 1991 and in those in animal production from 80 to 56; in the same time, degrees granted for agro-chemistry and food technology raised from 186 to 427 and for farm economics from 48 to 117. In Ireland the relation among graduates in agriculture and in food technologies was 5:1 in 1986 and it is nowadays 1:1. In USA new important fields are the biotechnological sciences: after having intensively promoted these courses students are doubled from 1990 to 1995. In Holland new courses are recently introduced as logistic, raw materials, biotechnology and environmental technologies. The agrarian high education lives a scientific paradigm's change, that will influence all the sections of AKS, as the technological research's paradigms and trajectories and the extension services' goals and organizations.

The OECD conference was organized with the objective of reducing the public expenditures in AKS by the more affluent countries. Work group's final report on research said that rationalization is the key word for the future because it is necessary, in a short term vision more than in a long term one, an adjustment of the research's supply to market demand, that is expressed not only by the farmers but also by more large consumers and stockholders groups. Work group's final report on extension services, after having remarked that the services are privatizated in all the world, affirmed the opportunity to maintain a public contribution, indicatively fixed in 20%, for public functions of extension services in adults education, pilot programmes of rural development and environment protection. Work group's final report on high education, premising that education replays to the specific needs of each country, related to his development stage, confirmed the necessity of a deep revision of the high education system and its orientation to the market demand, with the aim to reduce the quota of public financing inside the developed countries.

[†]In USA the AKS staff amounts to 49,000 persons and the expense to 9,000 M$, 56% of which are spent by the states and 44% by the privates. In Japan the AKS staff is about 38,000 persons (21,500 of who are researchers, 5,000 teachers and 11,500 advisers) and the expense 2,300 M$. In Canada, the staff is about 14,200 persons, 6,000 of who researchers, 1,200 teachers and 7,000 advisers, and the expense 1,000 M$. Among European countries, France and Italy have the most important agricultures and the most important AKS: France has the largest staff and Italy the biggest expenditure. French staff is about 30,000 persons (15,000 of who employed in research, 3,500 in high schools or universities and 11,500 in extension services) and the cost is 1,500 M$, 850 of which spent by the state and 650 by privates. AKS' Italian staff is about 19,000 persons (4,000 in research, 3,000 in agriculture or veterinary faculties and 12,000 in extension services) and the cost 2,900 M$, 1,450 of which spent by the state and 850 by privates. In Italy the AKS' financial expenditure is double than in France, being the Italian AKS' staff equal to two thirds of French one. The AKS' staff in the other European countries is about 8,500 persons in the Netherlands, 8,400 in Sweden, 6,000 in Denmark, 5,300 in Germany, 2,800 in Austria and 1,000 both in Belgium and in Finland. Germany has a relatively high expenditure (1,333 M$), followed by the Netherlands (700), Denmark (465), Sweden (260), Austria, Belgium and Finland (each of them with about 200 M$).

[††]The graduates students in agriculture are 2,500 in France, 2,800 in Italy, 1,400 in Germany, 1,100 in Holland, 500 in Austria, 300 both in Denmark and in Sweden and a little less in Belgium; post-graduates students are 300 in Germany, 180 in France, 160 in the Netherlands, 142 in Austria, 80 in Italy, 60 in Sweden and 53 in Denmark.

The OECD conference's original objective drawed inspiration from a tatcherian or reaganian philosophy and overestimated the market's role. Market is a spontaneous order that shares a quantity-value knowledge among farmers: farm's organization is a delivered order, which accumulates the quality-value knowledge that improves the innovative technologies in agriculture. Quantity-value knowledge creates a steady state; quality-value one promotes the steady state's breakage and the economic change and development, further giving to the market the opportunity to create a more satisfying spontaneous societal order. The original OECD conference's objective supposed that AKS, in general, and extension services, in particular, have only the task to substitute the market to spread quantity-value knowledges; the OECD conference's promoters forgotten that, through the modern information highways, market reduces a potential *"learning society"* to the lowest common denominator of a stupid global village. Facing modern technologies, market spreads among all the farmers only the major companies R&D's innovations. Thus the AKS' rationalization really means the guidance of the agriculture by the market quasi-monopolistic forces and the renounce to the food quality and safety, to the sustainable agriculture and to the rural development.

During the general debate about the work group's final reports a strong passage was my declaration that, as agronomist, as teacher in a faculty of agriculture and as expert of the Italian ministry of agriculture, *"I felt me in the AKS' meeting as a cow carried to a slaughter-house"*. USA delegacy came in my help declaring that we need to shift from "agrarian education" to a "full system education", which comprehends not only agricultural but also food sciences and technologies. French delegacy expressed an important concept: since the modern agriculture is an advanced polyfunctional system, it needs more, not less, knowledge. All the members of the OECD conference on AKS, excluded England (yet not the whole Great Britain), concluded that food quality and safety, rural development, environment preservation and "human development" are the objectives that still request the maintenance of a strong AKS in developed countries. In a private talk I said to the USA undersecretary of agriculture that we must be optimist, not pessimist; He replay to me that we cannot be optimist, but realist.

The future of technological change and services evolution

The extension services have three main functions:

(i) As quasi-market agents, the extension services spread among farmers the quantity-value knowledges, directly contributing to the agriculture and other local economic networks' competitive capabilities and indirectly to the AKS' growth.

(ii) As rural district's quasi-organization agents, the extension services are the versatile integrators that actively work in the knowledge spiral's segment, where the scientist's explicit, codified knowledge is conversed into the farmers' tacit, contextual one and vice versa, for improving technological and organizational innovations.

(iii) Being the agriculture the core of the linkages between biosphere and anthroposphere, the extension services have the tremendous responsibility to effect the future tactics in the Gaia game, playing more or less harmoniously the keyboard of the biosphere SR-information, contents of a pool of genes, and of the anthroposphere SR-information, contents of a pool of knowledges. The rural development is a strict economic development's path we can follow for reaching sustainability, inside a conservative change's conception of economic and social development.

The final declaration *"A living countryside"* of the European Conference on Rural Development (Cork, Ireland, 6-9 November 1996) explicates the marshallian idea of conservative change in the light of the rural development in Europe. The Cork declaration is aware that rural areas, which are the home of a quarter of the population and account for more than 80% of the territory of the European Union, are characterized by a unique cultural, economic and social fabric, that is by an extraordinary patchwork of activities, and a great variety of landscapes. The Cork declaration is conscious that, paying European citizens a growing attention to the quality of life and to questions of quality, health, safety, personal development and leisure, rural areas are in an unique position to respond to these interest and offer grounds for a genuine, modern development model of quality.

The Cork declaration enunciates ten points of rural development's programme, whose points 1 (rural preference), 2 (integrated approach), 3 (diversification), 4 (sustainability), 5 (subsidiary), 8 (finance) and 9 (management) are of a more remarkable interest. Sustainable rural development must be at the top of the agenda of the European Union: this aims at reversing rural out-migration, combating poverty, stimulating employment and equality of opportunity in rural areas; so a growing share of avaibles resources should be used for promoting rural development and securing environmental objectives, with a fairer balance of public spending in both infrastructure investments and educational, health and communications services between rural and urban areas. Rural development must be multi-disciplinary in concept and multi-sectorial in application and base itself on an integrated approach, which provides the agriculture adjustment and development, the economic diversification, notably in the small-medium scale firms and rural services field, the management of natural resources, the enhancement of environmental functions and the promotion of culture, tourism and leisure. The supports for the diversification of economic and social activity must focus on providing the framework for self-sustaining private and community-based initiatives, as investment, technical assistance, business services, infrastructures, education, training, integrated advances in information technology, strengthening the role of small towns as integral part of rural areas and key development factors, and promoting the development of viable rural communities and the renewal of villages. The rural development can sustain the quality and the amenity of Europe's landscapes (natural resources, biodiversity and cultural identity) so that the use by today's generation does not prejudice the options of the future generations. In local actions we must be aware of our global responsibilities. Following the principle of subsidiary the rural development must be decentralized as possible and based on partnership and co-operation between levels concerned: emphasis must be on participation and a "bottom up" approach, which harnesses the creativity and solidarity of rural communities. The use of local financial resources must be encouraged to promote local rural development projects: a greater participation by the banking sector (public and private) and other fiscal intermediaries must be encouraged too. The administrative capacity and effectiveness of regional and local governments and community-based groups must be enhanced through the provision of technical assistance, training better communications, partnership and the share of research, information and exchange of experience through networking between regions and between communities. Information and a mix of explicit global knowledge and tacit local one are the major tools that for European Commission the rural networks can improve in the next future.

European Commission has taken in charge that knowledge's growth is a general tool to solve two major problem in the European economic development: the production of the innovations and the education and training of the young generations. According to the *"Green Paper on Innovation"* (European Commission, 1995) and to the *"White Paper on Education and Training"* (European Commission, 1996), also farmers and agricultural extension services must go towards an innovative logic of organization, whose features are: (i) strategic skills (long-term view, ability to identify and even anticipate market trends, willingness and ability to collect, process and assimilate technological and economic information); and (ii) organizational skills (risk's taste and mastery, cooperation between firms and public research consultancies, involvement of the whole firms in the process of change and investment in human resources). Research, development and use of the new technologies are the key-elements to innovate, that is the *"technological factor"*. Farmers must take a more organizational effort to adapt the methods of production, management and distribution. Human resources are the essential factor for initial and ongoing training and play a fundamental role in providing the basic skills in constantly adapting them.

Inside a *"learning society"* the education systems and all of those involved in training have a central role to play. Social partners in exercising their responsibility including collective bargaining have an important role, as their behaviours will condition the working environment in the future. The ability to renew and innovate depend on the linkages between the knowledge growth in research and the knowledge transmission through education and training. Communication will be essential both for generating and disseminating ideas and innovations. The change connected with information technology will have wide economic and social consequences for the development of self-employment, the services industries, the new forms of work organization, as "learning organization", and the management decentralization. The quasi-instantaneous INTERNET information offers a big potential in the information highways to contact firms, researchers and academics: the fear is the risk that the quality of multi-media products could lead the knowledge to the "lowest common denominator" in which peoples lose their historical, geographical and cultural behaviours.

The economic system is built upon the foundations of agriculture, the agriculture on those of biosphere and the biosphere, if we trust Lovelock's hypothesis, upon those of "Gaia". Being agriculture at the boundaries between social and natural systems, the agricultural extension services, more or less consciously, master the co-evolution between society and environment, both in developed countries and in the developing ones, through their function of versatile integrators of knowledge. Thus the service play a double pivot role: the one in the AKS's growth and the other in the Gaia's evolutionary games. During the last forty years an exempla of the AKS' growth and of the Gaia's evolutionary games' change has been, both in the SR-information stored into living paganism's DNA and in that stored in farmers and advisers' knowledge, the grandiose progress of genetics that has been more or less fast transmitted by the extension services to all the farmers in the world.

The extension services will have in the third millennium the task to master social and natural co-evolution, in such a way that the speed of the first does not destroy the capability of the second to run on (to live and evolve). Europe and developed countries are conscious that the anthropospher's evolution is an important part of the biosphere evolution and that rural world must maintains its secular mission of harmonizing the two "spheres", inside the whole Gaia evolution. In this consciousness, we trust that there will be a future of the agricultural extension services and of the whole AKS in Europe and in the other developed countries.

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