THE ROLE OF EDUCATION, KNOWLEDGE AND HUMAN RESOURCES FOR THE AGRICULTURAL DEVELOPMENT IN THE PERSPECTIVE OF NEW CAP: AN HYPOTHESIS OF CHANGE IN BASILICATA

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Abstract: The role of education, knowledge and human resources in the agribusiness becomes of primary importance for the development of agricultural sector and, more generally, of the territory. The main objective of the present paper is to verify the role of investment in human resources and, consequently, in services for the agricultural development for the dynamics of rural development, trade and international cooperation of agribusiness. After a literature review, the paper firstly analyses the characteristics of the Italian Region of Basilicata, selected for our empirical application, and secondly develops an econometric model to explain the relationship between the rural GDP and a set of economic variables and of network-education-social (NES) dummy variable. These NES is representative of social, educational and, network factors, describing the degree of openness of the region firm. As expected, the results show that farmers may act as engines for economic development when they are trained on the basis of the needs and requirements related to innovation and research, and they are assisted through new models of organization of agricultural services.

Keywords: Development Services; Human resources, Knowledge; Educationet

1. Introduction

The economic and social development in European countries and, more generally, in advanced societies has led to a deep re-thinking of the role of the agricultural sector, generating an extensive and long reflection on the relationship between the citizen (consumer and user of land for food) and the farmer.

In this context, it was necessary to define a new model of sustainable development and integrated land and, therefore, a new model of agriculture that should be developed to provide the rural area, as well as agricultural products and foodstuffs, also goods and services resulting from the many economic functions, environmental and social demands. A farmer capable of being the engine of competitiveness, sustainability and integration of the agricultural component in the countryside, in which he clearly has his social, environmental and economic role. In this framework, sectorial policies and the role of human resources in agriculture must be the instrument that can ensure the development of this new model of farming. To this end, an important role could be entrusted to agricultural extension services, in order to educate, train and create awareness for enterprises, businesses and territories.

2. The role of agricultural extension services

The agricultural extension services are particularly important in order to revitalize the area as they can act on the motivation and knowledge of producers, actively building new relationships and new ways of interacting. It is necessary, however, the direct involvement of the territories, taking a different nature than before. Multifunctional and the subsidiary improve the contextual knowledge and increase the participation of farmers, reinforcing learning ability and decision and generates the creation of new networks of agricultural knowledge. The agricultural enterprise, can also be regarded – within the broader concept of rural life – from the technical and economic point of view and from the legal and economic view, in two distinct parts (*Bellia* 2001): as a producer of services (a concept derived from multifunctional agriculture, as a public good of social relevance as well as economic) and as a consumer of services (those that the company buys and / or otherwise acquires). This *status quo* has strongly diversified the mission of agricultural extension services connecting in this way to the company context to compete in a global market where it is essential to contain production costs and increase productivity of factors. The effectiveness of development services follows from the

perceived ability to generate real benefits for businesses and generate virtuous cycles that have an impact on knowledge systems and networks of relationships. The services are therefore an essential tool to facilitate and identify directions for change.

The Italian experience in the field of agricultural extension services commonly show a strong evolution in the framework (EC regulation 270/79), adopted by Italy in compensation for the disadvantage of the lower level of support for agricultural production in Italian, which has financed the training of agricultural extension and the subsequent establishment of organizations specifically designed to technical assistance, opening the way for the construction of a decentralized system of services.

In this context, the field of "agricultural services" has a strategic role: it is in fact called upon to adapt to the demand of farm innovation induced by the new orientation of agricultural policies and new market and consumer requirements (*Costanzo et al.* 2001). The development services demand is a function of services supply available to farmers and of other variables, such as structure, size, the average age of the settlement, and so on (Dinar 1989) and is directly connected to the amount of operating capital, years of experience of the farmer and his level of education (*Bagi and Bagi* 1989). The problem is the excessive fragmentation and duplication of roles and uncoordinated projects (such as promotion or training). For this reason, human resources have low skills as result of the recruitment method and the lack of training: also general employment in the service sector is undesirable and is often seen as second best, temporary or additional job. This *status quo* means, the prevalence of administrative-bureaucratic support. The goal, is to promote a radical change in the system in regional context.

3. The evolution of development services: from agriculture to rural

The services for agriculture are complex and constantly evolving and include the technical and economic assistance and other forms of dissemination of information and innovations that enable companies to better express their economic and social capacity, reducing the negative influences of constraints and risks due to lack of knowledge of the context. When the application of EU policies has become more complex, public services have supported companies in implementing of new procedures and adapting to the new logical support. The Reg. (EEC) 270/79, had the aim to overcome the disadvantage that divides Italy from the other Members of the EU, thus it aimed to implement the National Framework Plan of agricultural advisory panel to allow the establishment of a multi-regional training system (the ICTAE – Interregional Centre for Training of Agricultural Extension) and to grant the subsequent inclusion of two thousand new professional advisers.

From 1989 to 1993, under the Community Support Framework for Objective 1 Regions was made a Multiregional Operational Programme for the Development of agricultural advisory services and related activities. The second half of the nineties saw the dissolution of ICAE (Inter-regional Committee for Agricultural Extension), which coordinated the activities of the Framework Plan, which closed in 1995, and the beginning of the crisis in the education system of ICTAE. The next *national program on Agricultural Development Services* (PNSSA) was an integrated system of agricultural development services including: research and experimentation, agricultural statistics, training and updating of the paintings; consulting company, technical services support, vocational training for farmers; information. However, due to its complex structure, the National Plan has been only a declaration of intent. With the Fischler reform of the CAP, the EU has reviewed the importance of services for agriculture as a useful tool for implementing policy objectives. The reform indicates that each Member State has to set up an advisory system – the FAS (farm advisory system) – targeted to farms, which cover at least the requirements and compliance standards. The Program for Rural Development 2007-2013 has offered to the Member States a support to the creation of the FAS with specific funding. However, this requirement is part of a global strategic Community design, in which is assigned a role of importance for the agriculture to services for the improvement of human potential and the profitability of companies and more generally the achievement of strategic goals for developing the competitiveness of the primary sector (Axis I).

The establishment of the system of advisory services is therefore provided as part of a series of measures which are complementary and competing, aimed to intervene directly on the development of human capital, such as training and information for professionals involved in the primary sector (measure 111), but also to assist the entrepreneur to carry on business activities such as the use of advisory services (measure 114), goodwill of replacement services (measure 115), the Cooperation for the development of new products, processes and technologies in agriculture and food sector and forestry sector (measure 124).

Modern agriculture, in addition to the function of food production, contributes to the formation of the landscape, the sustainable management of renewable resources and the improvement of the quality of life in rural areas. This characteristic of multi-functionality, although common to other sectors of the economy, in agriculture has special importance for the weight of these "joint products" (*Zezza* 2001). The complexity of problems related to food safety and environmental protection requires increasing cooperation within systems of knowledge in agriculture (research, training, dissemination), and between them and the different actors from producers to consumers and policy makers. This is the latest step in a process of growth and development of knowledge and services in agriculture. In this perspective, the new EU guidelines require a serious change in the behavior of farmers (*Delfino* 2007), assigning a strategic role in development services to develop communication systems,

especially those that promote networking among actors involved in extension services in agriculture, and between these actors and businesses. The regions are developing Rural Development Program (RDP) 2007-2013 EAFRD as well as the ERDF and ESF OP 2007-2013: these are the best opportunities to develop the necessary services and the management procedures in line with the strategies identified in them, and to activate the integrated and multi-fund development and services projects (from research, planning, logistics). This is mainly to take account of new types of entrepreneurs, new organizational models – chains, clusters, etc.. – and new goals and challenges of the food sector in the current programming period and in the near future.

4. The role of knowledge and human resources in agriculture

The changes that have affected agriculture in recent years have been extensive because of new relationships between ownership and enterprise, new organizations of production and work, relationships with different markets, new forms of entrepreneurship. These changes depend by economic, social and demographic factors that have invested several European rural areas (*Montresor and Pecci* 2009). In this context, human resources can play a major role through the effects of spillovers on the creation of production process resources. Human resources have two effects: firstly, the increase of the labor productivity as a result of increased efficiency and skills of more educated labor, secondly there is an external factor that has to improve the average productivity of all workers involved in the productive process. This last effect as an indirect spillover impact and leads to an increase of the average level of skills of the human resources. At the aggregate level, these synergies create a process of endogenous growth of the territories (*Devitiis and Maietta* 2009). On the other hand, the required expertise to farmers from these mutated scenarios are very complex, including not only technical knowledge but also the ability to quickly acquire new knowledge or to work to produce them. The same scenario is valid for the professional skills of business consultants, public and private, often outdated or incomplete for the function of technology transfer requested by this profession (*Arzeni* 2007). This intense process of innovation is characterized by new production methods and new types of collaboration, as well as new products and services to be offered to the entire community. Farmers today have not to only aim to reduce costs, but also to analyze the possibility to better differentiate their production, with the aim of achieving greater competitiveness on the markets, to better respond to consumer expectations and European society (*Ballari* 2005).

Certainly, in the "adoption of a within-farming-system benchmark to set up best practice improves previous analysis of the competitiveness of regional specific farming systems" (*Reig-Martınez et Picazo-Tadeo* 2004), education becomes a crucial element (Suvedi et al. 2010) although the educational function of agriculture has not been fully examined despite the growing need for such services from urbanites (*Ohe* 2010). Furthermore, knowledge can become the key to the success of the farm only if it becomes operative (*Pilati et Boatto* 2007).

The CAP analysis shows that many misunderstandings and lack of efficacy, depend on lack of knowledge, especially informative and relational material in contravention of the cross-cutting nature of knowledge (ibidem). The speed and success of diffusion of the innovation depends upon site-level investments in schooling (*Weir et al.* 2006; 2004; *Weir* 1999).In fact, as it has already been proved in the literature, farmers' education improves eco-efficiency too (see, for example, *Van Passel et al.,* 2009; *Picazo-Tadeo et al.* 2011). Agricultural programs now encompass many high skill fields such as biotechnology, genetics, environmental sciences, renewable energy, aquaculture, veterinary sciences, landscaping, turf grass management, agronomy, natural resources, mechanics and construction technology just to name a few (*Illinois State Board of Education* 2010): a formal and informal education system should serve the promotion of knowledge and awareness to emphasize and motivate human resources too (Sharghi et al. 2010). An example of this process, is the Memorial Middle School Agricultural Extension and Education Center (MMSAEEC) that is an innovative teaching and learning model and unique role for New Mexico University Cooperative Extension Service (*Skelton et al.* 2010). Intermediate and higher education in agriculture continues to play a decisive role in rural development and sustainable agricultural production (*Alam et al.* 2009). In this context, the EU is carefully looking for competitive innovation, which requires the transition to a knowledge-based society capable of more widespread prosperity and greater social cohesion (Lisbon European Council 2000, the Treaty of Lisbon 2007).

Europe 2020, adopted by the European Council in 2010, should combine contributions from various levels: European, national, regional and local levels to build a smart, sustainable and inclusive growth (*Contò and La Sala* 2010). The post-2013 CAP reform process should fit with its own peculiarities in the 2020 strategy, promoting growth of agriculture and the rural economy and ensuring a greater degree of public support to companies to promote development in human resources and create a Knowledge systems for rural development. This would reduce the instability of the system of knowledge and its components through investments that promote skills, specialization, design. Ultimately, human capital becomes an important factor and training and lifelong learning become relevant variables of innovation and regional competitiveness.

5. The Basilicata region: a socio-economic context analysis

The RDP 2007 - 2013 in the Basilicata region, taking the methodology adopted by the National Strategic Plan, ranked

Basilicata entirely rural, mountain and hill defining the "Rural area with complex problems of development" and plain "Rural areas with intensive agriculture specialist (Figure 1).

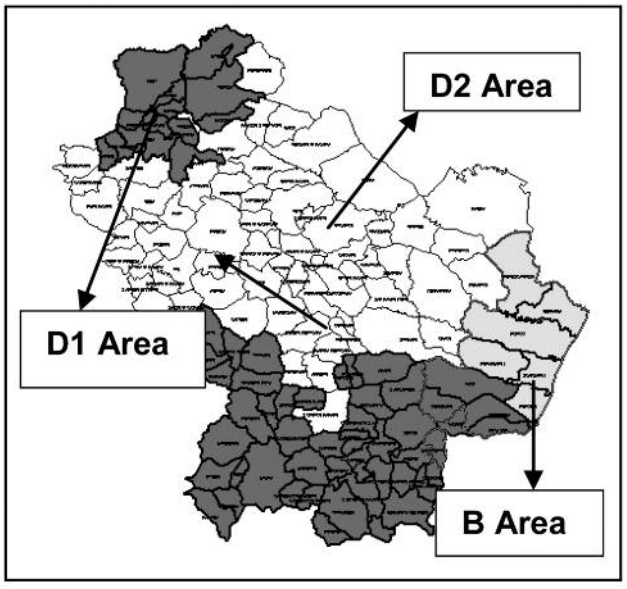

Fig. 1: Rural structure of Basilicata
Source: RDP 2007–2013 Basilicata Region

The classification made by the National Development Program (NDP) in the region showed the presence of two types of land, in which lie the three macro-areas identified at the regional level (Table 1).

Tab. 1: Classification of the territory of Basilicata

Classification NDP	Classification RDP
B. Rural areas with intensive agriculture specialist	**B.** Rural areas with intensive agriculture specialist
D. Rural areas with complex problems of development	**D.1.** Area for agriculture with the most advanced organizational models **D.2.** Areas within the hills and mountains

Source: Our elaboration on DRP 2007–2013 Basilicata Region

Most of the territory (92%) and population (88.1%) falls in the rural area characterized by lower population density and structural problems of development. In such areas it is most felt the problem of an aging population and depopulation of small towns. The population structure by age shows, in fact, in areas D1 and D2, greater aging of the population, as evidenced by the index of aging is higher than the lowest rate of generational turnover compared to the area B and the regional average. This population structure has also a negative fallout on agricultural holdings of those areas where most of the wires are old, and is also reflected in the level of education of conductors of farms (Table 2): D1 and D2 areas, where there are fewer young people, the number of graduates is lower than rural area B, while the percentage of illiterates is almost twice that of the B and also the relative value to the owners of the only primary school is higher.

The data analysis shows the presence of differences between the sexes: males possess a higher level of education in all three areas examined. In terms of employment, the primary sector, in terms of percentage of people, of greater importance in the rural area B with intensive agriculture, with 21% of employment. In the other two areas D1 and D2 has relevance to the tertiary sector, which accounts for respectively 54.3% and 60.9% of employment, because of the presence in these territories of the two provincial capitals, where public offices and services are prevalent.

With regard to agricultural use, the area B has a greater incidence of utilized agricultural area (UAA) is higher than the surface area that the total agricultural area (TAA), confirming the more intensive nature of this territory. The average size business, lower than the regional figure, further confirm the intensive nature of agriculture, if this value is related both to the contribution to the establishment of the regional agricultural value added (25% compared to 9.4% of UAA), and the division of UAA between major destinations. In area B, in fact, more than 1/3 of the UAA is invested in permanent crops. Conversely areas D1 and D2 are predominantly extensive agriculture. In terms of quality of life for people, surely the presence of infrastructure and services and their strengthening, influences and contributes to the retention of principals and productive living in rural areas. From the numerous spatial analysis conducted in the area, there was evidence that the infrastructure framework is not always adequate to the needs of rural people and enterprises, and even less for those living in mountainous areas in agro-forestry and pastoral vocations. This finding, along with a low rate of generation change, depopulation, low population density, negatively affects the ability to trigger new processes and job opportunities. Another

Tab. 2: Conductors by area and level of education

Area	Total					Of which male				
	Degree	High	Junior High	Elem.	None	Degree	High	Junior High	Elem.	None
B	4,3	19,2	27,9	37,6	11,0	4,2	19,6	28,9	36,8	10,5
D1	2,4	14,6	19,3	43,0	20,7	2,7	15,0	20,4	42,4	19,4
D2	2,4	12,5	21,1	44,5	19,4	2,9	13,2	22,5	43,3	18,2
Total Basilicata	2,6	14,1	21,2	43,1	19,0	3,0	14,7	22,4	42,2	17,8

Source: ISTAT 2001 agriculture census

important factor, also linked to the progressive aging of the population and therefore a decline in learning, is the low percentage of adults participating in training: less than 6% of the total. Access to the countryside as an extension, is satisfactory in the region, particularly in the areas located near main roads and area B. The index assumes a value of road equipment in Basilicata significantly lower than other regional groupings (45.6 against 58.8 in the South, 52.5 and 55.1 of central and northern Italy). With regard to the railway network, the region is poorly covered and all the features have a single track, a condition which significantly slows the traffic. With regard to communication infrastructures (ICT) for farms and rural populations, rural areas are generally poorly served than in urban areas.

6. The dataset

Our dataset includes data from farms that are members of the Confagricoltura of the Basilicata region, which are about 400. A stratified random sample of farmers was drawn among the main sectors of the agricultural economy (fruits and vegetables, olives, wine, cereals, zootechnical). The study, developed over two years of work, then used a descriptive-survey method for the data collection on a range of 5 years from 2005 to 2009. The survey methodology was qualitative and on field; the surveys were mailed to the stratified random sample in January of 2010. After two months, a follow-up letter was mailed to the sample population and then there was a contact call (Suvedi et al. 2010); after one month, the survey was completed through the organization of a focus group too. The survey had a response rate of 57,5% (that is 120 farmers). In the case of missing answers, these were treated as missing values. The survey included both closed and open ended questions and was structured in two sections on the five-year period 2005-2009. In the first section respondents were asked to indicate: value-added, capital investment, numbers employed, percentage share of exports, percentage share of R&D expenditure. In the second section respondents were asked to indicate:

- educational level of farmers;
- participation in master, skills, training;
- enrolment in professional associations;
- activation of external collaborations of specialist consultants (agronomists, experts in biological, etc..) and generic (economic consultants, experts in finance and development programs);
- presence of a survey system of customer satisfaction (Arrighetti et al. 2011);
- members to clusters, networks, entrepreneurial networks.

The introduction of the questions in the second section was intended to capture the "degree of opening" to inputs from the external environment and markets (Arrighetti et al. 2011) in terms of network, human resource, and knowledge. The expected results from our research is the creation of Value Added should be increasing at high levels of economic variables and, in special way, of network-education-social (NES) variables too.

6.1. The econometric model

The empirical study will be carried on through an econometric analysis based on a panel data model (OLS and GLS estimates). The econometric model explain the relationship between the agriculture GDP and a set of economic variables and of (NES) dummy variable representative of social, educational and, network factors, connoting the degree of openness of the region firm (such as schooling of entrepreneurs, training, enrolment in professional associations, collaboration with generic experts and/or specialists in the field, presence of a survey system of customer satisfaction, association to districts, cluster or network, etc.) in the period 2005/2009. The relationship between the level of per capita value added (VA) of the sample and the predictor variables was developed in two steps: in the first step we study the link between economic and structural variables and VA; in the second step we study the possible change of the coefficients and statistical significance of predictors with the inclusion of the second set of macro variables, educational-social-network (NES), defined as schooling, knowledge, associations, and ultimately, human resources. The functional equations of the first and second step are:

1. $VA = f(Ec_{it})$ *first step*
2. $VA = f(Ec_{it}, NES_{it})$ *second step*

Where:

VA represents the dynamics of value added in the period 2005-2009

Ec represents the vector of economic and structural variables characterizing the Basilicata farm

NES represents the vector of network-educational-social (NES) dummy variables expressing the degree of opening of the farms to change and the external inputs.

First step

The equation of the first step appears in the simple following form:

$$\ln VA_{it} = \gamma_i + \beta_1(Inv)_{it} + \beta_2(Occ)_{it} + \beta_3(Exp)_{it} + \beta_4(R\&S)_{it} + \varepsilon_{it} \quad [01]$$

and the final equation of the second step is presented in the following log-functional form:

where:

- $i = 1 \ldots 120$ indicates the 120 farms selected by stratified random technique before and then depending on the response to the survey;
- $t = 2005 \ldots 2009$;
- γ is the constant;

- β represents the estimated coefficients of the first step economic and structural variables (Investment, Employment number, Percentage of exports, Percentage R & D) and of the network-educational-social (NES) dummy variables (DSchooling[1], DschoolingH, DTraining, DAssociation, DExpert_ specialist, DExpert_generic, DSatisfaction, DNetwork);
- ε is error term.

$$\ln VA_{it} = \gamma_i + \beta_1(Inv)_{it} + \beta_2(Emp)_{it} + \beta_3(Exp)_{it} + \beta_4(R\&S)_{it} + \beta_5(DSchool)_{it} + \beta_6(DSchoolH)_{it} + \beta_7(DTrain)_{it} + \beta_8(DAss)_{it} + \beta_9(DExpert\_spec)_{it} + \beta_{10}(DExpert\_gen)_{it} + \beta_{11}(DSatisf)_{it} + \beta_{12}(DNet)_{it} + \varepsilon_{it} \quad [02]$$

6.2. Results

The results obtained by the first model show a high significance of the economic variables, in line with expectations at theoretical and contextual levels. The second step of the model is better specified and there is no heteroskedasticity. Overall, economic variables still have a high statistical significance; the Export variable, in particular, has a strong correlation with the VA. Regarding the NES dummy, they are an important, significant, part the DSatisfaction variable, that might not be significant maybe because of the weakness of the firms that adopt the system for collecting customer satisfaction in the primary sector. The Dschooling variable, significant at 10% (0.094), would result an increase of 1.6% of VA while DschoolingH, significant at 5% (0.050) would lead to an increase of 9% of VA. The Expert_Special dummy (p-value = 0.000), however, would change in the incremental flow of VA in an amount equal to 10.6%. It is necessary to clarify that the present work represents the second step of a study that began two years ago (Contò et al. 2011); this last one uses a mail survey for farms in a Basilicata cluster (the district of Metapontum agro-food district of quality).

Such an investigation was in fact done by expanding the dataset to firms registered at the Confagricoltura; then the results of the survey were used to develop an econometric model. This work may still be considered a work in progress for some of the gaps (treated as missing values) as a result of the incompleteness of the questionnaires and the inconsistency of some data (perhaps because of the complexity of the questionnaire developed over 5 years), due to the not high schooling of their responders. For these reasons, the functional relationship it has ongoing changes and additions that will provide a better definition of the same model and better model specification.

7. Conclusions

The results show, as expected, that the increase of the formation and the degree of openness of the network in terms of human resources and knowledge, associations and cooperatives, corresponds to increased benefits for the farmers and their firms in terms of added value.

Being part of a network, a district or professional network, members of a trade association or a service center, and having a high education and permanent training too, is mandatory to follow the trends and new frontiers of development locally and internationally, may be significant elements for the farmer so that they can be the key to success for the leap of a sector in crisis as the primary.

To improve the competitiveness of European agriculture, therefore, not only businesses are needed but also adequate structured entrepreneurs that are able to organize and manage. The effort of sectorial policies in the coming years should be to gradually shift the focus away from productive structures of stakeholders and status of enterprise to the status of farmer and to the results achieved by the entrepreneur. In this way, not only would it have reaffirmed the centrality of the entrepreneur as a pivot of agricultural development, but the human factor has an economic value to be capitalized thanks to public funds too. In fact, European young farmers, despite the sector's structural and economic difficulties, have shown they have the skills to build a European model of diversified, competitive, innovative, multifunctional and sustainable agriculture. To operate in an evolving market, the source of many opportunities but also new risks, we need tools such as training, counseling, community life and be a member of a network.

The farmers may act as engines for economic development when they are trained on the basis of the needs and requirements related to innovation and research, and they are assisted through new models of organization of agricultural services. These inputs are a useful tool for development strategies to support different levels of local governance and be able to define new models and growth paths of entrepreneurs and enterprises, in line with the development prospects of the sector and implementation RDP 2007 - 2013.

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[1]This dummy associate 1 if the farmer has a graduation, 0 otherwise; DschoolingH associate 1 if the farmer has a degree or two years' professional training, 0 otherwise.

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