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NEW ROLE OF AGRICULTURAL EXTENSION AND ADVISORY SERVICES BASED ON CURRENT FINDINGS AND FURTHER COLLABORATION FOR IMPROVED NUTRITION

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ABSTRACT

Nowadays, there are a number of projects tackling on challenges around which this study is based. For instance, the ultimate goal of the current project SKIN is to create a permanent stakeholders' association on short food supply chain (SFSC) that works on the joint economic growth of the agricultural sector through the exchange of local food practices and through coaching sessions stimulating innovation. It creates a European network of best practices in SFSC that addresses the fragmentation of knowledge in the agricultural sector and supports bottom-up innovation initiatives. No doubts, boosting innovation through that project in local areas will lead to economic growth in the regions. But, for its sustainable development, it is crucial to create the agricultural extension and advisory services (AEAS), particularly in EU countries and also to modify their role using bottom-up approaches. Despite the fact that the role of AEAS in the EU countries is transforming in the last few years, from a technology transfer paradigm to a demand-driven model, there are still two challenges that should be tackled in the global agenda: 1) facilitate linking of local agricultural sector and nutrition; 2) build a sustainable network of advisors in the EU for improving knowledge flows in national and regional agricultural knowledge and innovation systems (AKIS). According also to the findings of the SKIN project and to our recently developed concept (FENIX), the launch of new initiatives will enable AEAS by gathering of a large amount of information and knowledge from local areas and population, helping all types of stakeholders to improve health, environmental, and economic sectors in targeted regions.

Keywords: *agricultural sector, innovation, extension, food security, personalized nutrition, rural advisory services.*

INTRODUCTION

A look at the current global health and nutrition situation suggests agriculture can make more crucial and invaluable contribution to health and nutrition. Indeed,

leveraging agriculture for health and nutrition has the potential to speed progress toward meeting all of the Millennium Development Goals (Fan *et al*., 2012).

Agricultural development is the only tool to end extreme poverty, boost shared prosperity and feed a projected 9.7 billion people by 2050. The leading cause of death worldwide is associated with poor nutrition. Approximately three billion people are either not eating enough or eating the wrong types of food, resulting in illnesses and health crises. A 2017 report found that 2.1 billion people were overweight and obese, and 62% of them originated from / were living in developing countries (FAO, 2017).

According to the World Health Organization (WHO, 2015) chronic diseases are the second leading cause of death in the world, now especially increased in developing countries (around 80%) and first of all it is various cardiovascular disorders (17 million deaths in 2002), followed by cancer (7 million deaths), chronic lung diseases (4 million), and diabetes mellitus (almost 1 million).

The global prevalence of leading chronic diseases is projected to increase substantially over the next two decades. For example, the number of individuals with diabetes is estimated to rise from 171 million (2.8% of the world's population) in 2000 to 366 million (6.5%) in 2030, 298 million of whom will live in developing countries (Wild *et al.*, 2004). A related problem is the rising number of people who are overweight or obese. One of the leading risk factors for chronic diseases is inappropriate nutrition.

The extent and rapidity of the rise of diet-related chronic diseases led WHO to call for action in its Global Strategy on Diet, Physical Activity and Health (WHO, 2004). The Strategy recognizes agriculture as a key distal determinant, stating that *"National food and agricultural policies should be consistent with the protection and promotion of public health. Governments should be encouraged to examine food and agricultural policies for potential health effects on the food supply. Agricultural policy and production often have a great effect on national diets. Governments can influence agricultural production through many policy measures. As an emphasis on health increases and consumption patterns change, Member States need to take healthy nutrition into account in their agricultural policies"* (WHO, 2004). A growing number of governments, donor agencies, and development organizations are committed to supporting nutrition-sensitive agriculture (NSA) to achieve their development goals.

Demand for empirical evidence of "what works" for nutrition through agriculture has arguably never been higher. In the past few years, there has been a proliferation of interest in how to leverage agriculture to maximize its impacts on nutrition (Webb and Kennedy, 2014). The belief that *"agriculture contributes not just to food production, but also to human nutrition and health"* (Global food policy report, 2011) is widely held, and it underpins ongoing efforts globally to *"make agricultural policies and programs nutrition-sensitive"* (Bill & Melinda Gates Foundation, 2012).

While consensus exists on pathways through which agriculture may influence nutrition-related outcomes, empirical evidence on agriculture's contribution to

nutrition and how it can be enhanced is still weak (Ruel *et al.*, 2018). Ruel and Alderman (2013) identified six pathways through which agricultural interventions can impact nutrition: (1) food access from own-production; (2) income from the sale of commodities produced; (3) food prices from changes in supply and demand; (4) women's social status and empowerment through increased access to and control over resources; (5) women's time through participation in agriculture, which can be either positive or negative for their own nutrition and that of their children; and (6) women's health and nutrition through engagement in agriculture, which also can have either positive or negative impacts, depending on exposure to toxic agents and the balance between energy intake and expenditure.

The question is: who will be the link between governmental, private, public, scientific, producers' sectors and the society as consumers? It should be the player, who came from the local environment with the passion and ability to play a key role in improving the future.

Agricultural extension and advisory services (AEAS) play an important role in agricultural development and can contribute to improving the welfare of farmers and other people living in rural areas. *"Rural advisory services, also called extension, are all the different activities that provide the information and services needed and demanded by farmers and other actors in rural settings to assist them in developing their own technical, organisational, and management skills and practices so as to improve their livelihoods and well-being."* (Christoplos, 2010). "Agricultural extension" describes the services that provide rural people with access to knowledge and information they need to increase productivity and sustainability of their production systems and improve their quality of life and livelihoods. It includes, but is not limited to, the transfer of knowledge generated by agricultural research. It has helped countries move towards meeting food needs, conserving natural resources and developing human and social capital (NRI, 2011). Nowadays, the role of AEAS remains important and potential, but still has a weak influence on the local population. Also, its role should expand from being a transfer of knowledge that links with nutrition to a real link between above-mentioned sectors, a mentor in the innovation.

The argument for it is showed up in the Global Forum for Rural Advisory Services as extension services enable farmers to take up innovations, improve production, and protect the environment. The extension shows positive effects on knowledge, adoption, and productivity. With studies showing very high (13–500%) rates of return to the extension, it is a cost-effective way to improve farmer productivity and income (GFRAS, 2012). AEAS imply more than just the transfer of technologies. In a broader sense, AEAS means the transfer of know-how and information, which will eventually enable the client/farmer to make his/her autonomous decision to change or modify the production and/or adopt innovations. The know-how in the meaning of not only technologies or marketing, but also innovative tools for maintaining/improving health conditions for preventing diseases.

The importance of agricultural extension and advisory services in relation to the fight against food insecurity and poverty in line with the aspirations of the Agenda 2030 for Sustainable Development cannot be over-emphasized. The same we can see in the politics of Horizon 2020 that provided over € 4 bn for agriculture and food research. Despite all efforts of the projects development and implementation, there are still two challenges: absence of uniting project that can tackle named challenges and the lack of consideration the local projects as the key players in the developing regions. As Fanzo (2015) stated - one of the major groups of AEAS providers are agricultural/rural development projects. The formal linkages between the three sectors of AEAS providers – public, private, projects – are emerging and still at an infant stage, but developing.

However, there is a lack of coordination, harmonization and quality assurance (standards). Therefore, there is a need for coordination and guidance to improve efficiency in service delivery. This will avoid duplication of efforts and most importantly cope with the new and dynamic demands of modern agriculture.

This paper aims to present innovative approach for creating new role of AEAS which is based on current findings of the ongoing project SKIN and further collaboration for improved nutrition through expertise described in our recent concept (FENIX). Building a sustainable network of new advisors will avoid duplication of efforts (all sectors remain fragmented) and most importantly cope with the new and dynamic demands of modern agriculture with the linkage with personalised nutrition.

MATERIALS AND METHODS

The paper is based on a mixed methodology, which includes: 1) the systematic literature review covering the following databases: PubMed, Google Scholar, and IBSS for the period from 2012 to 2018; 2) the interviews with smallholder local farmers and traders in Ukraine (Transcarpathian region) and the Slovak Republic conducted during 2017-2018.

Data were collected by structured questionnaires from the 75 stakeholders in the following regions: Transcarpathian (Ukraine), Kosice, Malacky, Littoral, Zilina, Presov, Banska Bystrica, Trencin, Bratislava, Nitra, Trnava regions in the Slovak Republic. Findings of the ongoing project SKIN by an extended review of secondary data are also summarised here.

As background for the FENIX concept, the data from clinical trials, mathematical modelling, and IT-based approaches had been used.

RESULTS AND DISCUSSION

To ensure sustainable agriculture as a basis for solving global problems, promoting strong economies (with the provision of jobs, budget revenues, and the reduction of migration flows), generating innovative ideas for development (e.g. circular bioeconomy), in line with environmental safety, enable improving and further maintaining human health, the extended role of the existing advice service is necessary. The adviser should be the player, who came from the targeted region. It

has the following reasons: common language, being present (physically) in the region for not only giving consultation, but also being a mentor during the whole process of improving knowledge, business, etc. The time of chaotic presentation is gone. So, the new advisor should be trained by the other experienced advisors, and he/she has to come to the region and transfer/support farmers to increase the impact of face-to-face interaction.

New advisors should be as coordinators that will not only control the process of bottom-up innovation, but also be mentors within building linkages between AEAS providers (*figure 1*).

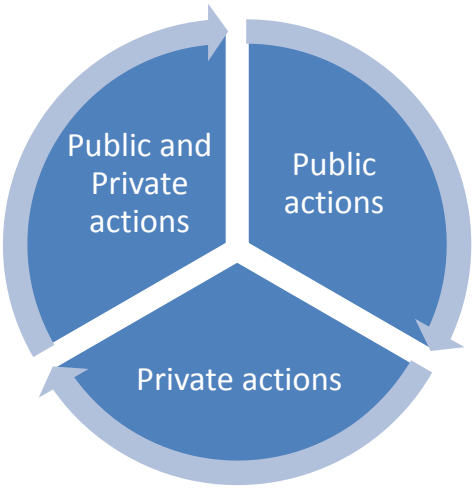

Figure 1. Linkages between AEAS providers

The advisor faces difficult tasks, that need to be solved due to his/her renewed role:

• The public sector is not ready to share the "goods" of the country and allow common collaboration between projects activities and private sectors.

• The project sector, as donors have a weak influence on the private and public sector in the meaning of achieving a common goal. Lack of trust causes separate work and cannot lead to continuous progress and development of results of the projects.

• The private sector tries to monopolize its own business in one way, without consideration of possible growth within a collaboration between above-mentioned sectors.

Nevertheless, all begin in the individual level – changes and adapting of the know-how causing a high level of insecurity at an individual and institutional level. This leads to the paradox situation: institutions (private/public sector), that have resources for implementing innovation don't want to do this (reasons: lack of trust, weak financial assessment); farmers, even they really want to adopt innovation – don't have knowledge and resources for it. With these challenges only advisors, as mentors and mediators can tackle providing knowledge to farmers, building a

trustful relationship, which will cause to accept innovation and promote economic growth.

Based on this study we have found that there are a lot of open questions on how to improve AEAS within new knowledge, what is the precise working approach that will link nutrition and agriculture particularly, and how to tackle the challenges that faced society of 21st century generally. Key opportunities for integration efforts in order to renew the role of AEAS are engaging communities, creating a demand for nutrition, and the use of innovative communications. But how and what knowledge should it be?

To answer the first part of the question, we propose to use the findings of the above-mentioned project SKIN. It is an ambitious initiative of 20 partners in 14 countries in the area of Short Food Supply Chains (SFSCs). It intends to systematise and bring knowledge to practitioners, promote collaboration within demand-driven innovation logic and provide inputs to policymaking through links to The European Innovation Partnership on Agricultural Productivity & Sustainability (EIP-AGRI). SKIN will build and animate a community of about 500 stakeholders, with the strategic objective of setting up, at the conclusion of the project, a European association permanently working for the improvement of SFSCs efficiency and for the benefit of stakeholders and growth in the sector. The community will be built and animated around the identification of good practices in short supply chains across Europe. SKIN puts significant efforts in dissemination, to reach as many stakeholders as possible, and exploitation, to plan post projects developments in the form of a permanent association that would give continuity to the activities launched with the project (community expansion, circulation of good practices, promotion of research-based innovation and linkages with the EIP and policy-making instances). It's an absolutely direct answer to the wide range of the questions that remain open in the reviewed literature regarding how to engage the community and how to promote demand-driven innovation in agriculture and food production. SKIN will identify a vast population of 10,000 stakeholders in the sector, who will be informed, stimulated and targeted as potential new members of the Community.

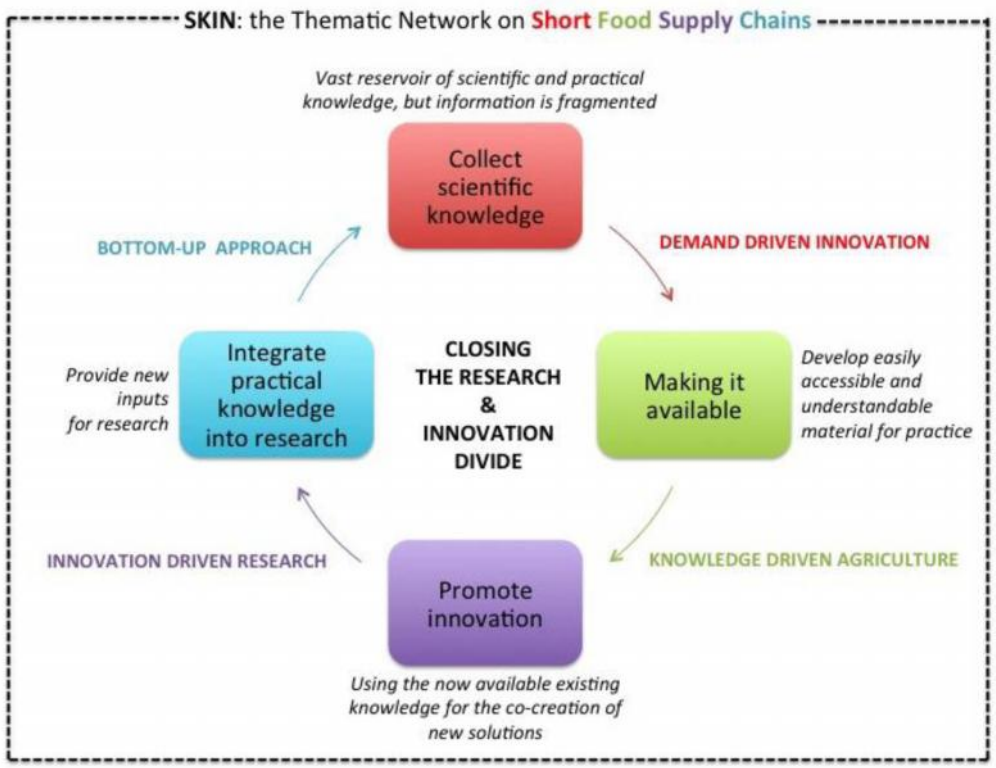

Figure 2: The SKIN Approach to Knowledge Exchange

Short food supply chains have economic, social and cultural benefits for farmers, consumers and rural areas in general. This sector increases the income of farmers and the consumption of fresh and relatively unprocessed food, brings consumers and farmers closer, engages public institutions in its promotion, helps to strengthen rural-urban linkages (particularly in the case of peri-urban agriculture) and contributes to sustainable development. The sector is growing across Europe to meet rising consumer demand. Thanks to the personal interview with the farmers, we can ensure engaging in further collaboration. We precisely know what are the problems that they face and we can ensure the demand in the innovation. Through the coaching session, the innovative projects calls will be developed to improve the situation. But from this point, two challenges remain: who will support the projects implementation and their continuation and will they be linked to the nutrition approach? The renewed AEAS can play the role of mentors in those projects. Nevertheless, they need to get knowledge about working and adapting to challenges of 21st century approach regarding personalised nutrition. It's also answering the above-mentioned challenges regarding presented diet for prevention of diseases and maintaining health conditions. At that point we propose the expertise of the innovative idea described in FENIX, that was mentioned above. This idea was developed by core partners, who are all innovative SMEs in their

particular expertise. FENIX proposes to exploit an easy-to-use coherent tool to make recommendations for personalized nutrition (PN) requirements that meet the precise needs of EU citizens. The beta version of it is already developed by Ediens LLC team. The tool proposed by Ediens is based on measurements and an innovative bioinformatics approach for interpretation of individual microbiome data with other relevant and crucial factors (evidence-based and correlated biomarkers, calculating age, gender and indicating personal health status, personal nutritional requirements, food composition data, lifestyle, cultural preferences, environment conditions) and also considers the available source and analytical characteristics of ethnic foods and innovative food processing approach of further individualisation proposed for local farmers and food producers. Ediens proposes to calculate this PN with consideration of the patented algorithm (correlated microbiome with biochemical / blood parameters – immune indices relevant to detection of inflammation biomarkers for early detected changes / shift between health / diseases condition / balance, to be really able to consider and to calculate all the other personal internal biological characteristic (genes, phenotypes, microbiome). Proposed IT tool / Algorithm / approach will take into account other crucial internal determinants – mental health, physical activity, stress, behaviour, food perception, culture habits, religion and food perception restriction, nutrition intuitive preferences and also all the sets of external factors: social (professional activity, social status) and economic factors (leaving allowance, budget). This will proceed via mathematical modelling PNA based on limited trial studies for adjusting in accordance to all data received.

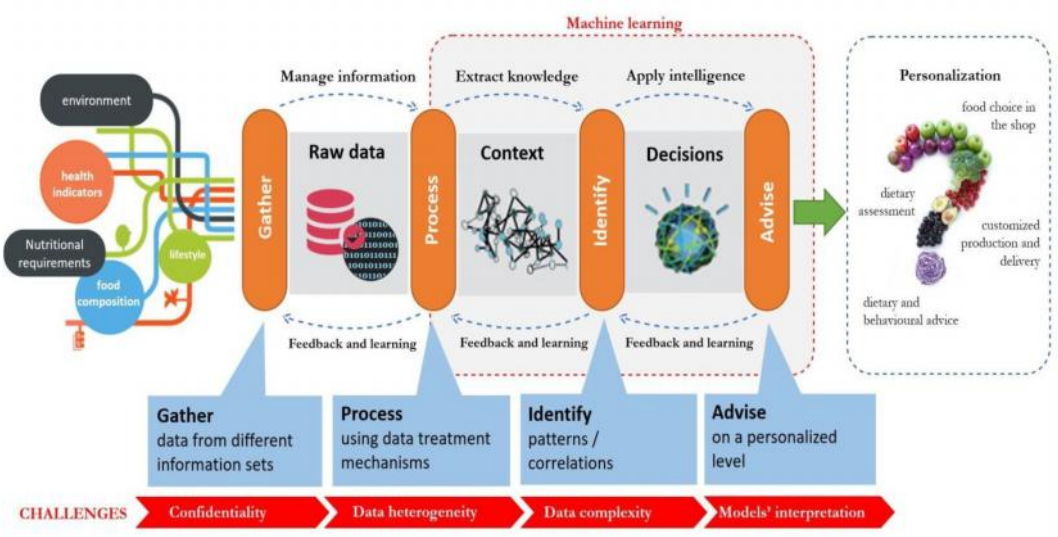

Figure 3: FENIX vision and approach. On behalf of core partners

CONCLUSION

We need to consider the already done research, projects activity to further improving agriculture system. It will avoid duplication efforts and can gather all relevant stakeholders to achieve common, ultimate goal – to build sustainable health, productive, welfare society in a friendly environment. For that reason, we should use a bottom-up and demand-driven approach that will ensure trust, build community relationship, boost needed innovation, create new job places, decrease migration, to provide health conditions to the society, save the environment. In that case, we see that the new advisors can be a driver for those changes. The good practices collected by SKIN farmers, familiar for the local community, can help in it. The information on innovative personalised nutrition approach provided by Ediens and described in FENIX will ensure that local food can be a functional food for maintaining microbiome status particularly, and healthy condition in general.

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