China's Higher Education in Agricultural Science. Coping with challenges through transformative models

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in

Romagosa I. (ed.), Navarro M. (ed.), Heath S. (ed.), López-Francos A. (ed.). Agricultural higher education in the 21st century : a global challenge in knowledge transfer to meet world demands for food security and sustainability

Zaragoza : CIHEAM
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 113

2015
pages 173-182

China's Higher Education in Agricultural Science. Coping with challenges through transformative models

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Abstract. In the recent past, the last twenty years, a lot of measures were undertaken in driving the development of China's higher agro-education. These included strategies such as modification of developing models, reformation of administrating system, granting of Project "211" or/and Project "985",implementing the Plan of Top Agro-forestry Talents' Training, optimizing the structure of agro-higher education and encouraging to establish world-class universities in agro-science. A preliminary achievement has been realized: three Chinese agricultural universities' ranks, keep on rising in the recent years. Though they originated their destinations as world-class agro-universities, the large gap remains. To cope up with the new challenges, initiative transformative models have been adopted. The models are university institutional re-organizing, setting up overseas joint institutions or programs as the Agricultural Confucius Institute, the establishment of national collaborative innovation agro-centers and New Rural Development Institutes.

Keywords. China – Higher agro-education – Developing model – Challenge.

L'enseignement supérieur de la Chine en Sciences agricoles. Faire face aux défis à travers des modèles transformateurs

Résumé. *Au cours de ces vingt dernières années, beaucoup de mesures ont été prises dans la conduite du développement de l'agro-enseignement supérieur de la Chine, telles que la modification des modèles de développement, la réforme du système de l'administration, le projet "211" et / ou le projet "985", la mise en œuvre du plan formation de talents « Top agro-forestiers », l'optimisation de la structure de l'enseignement agro-supérieur, et l'encouragement à créer des universités de classe mondiale dans l'agro-science. Une réalisation préliminaire a été faite : les rangs de trois universités agricoles de la Chine ne cessent d'augmenter dans ces dernières années, bien qu'un grand écart reste encore à être couvert. Pour faire face aux nouveaux défis, des modèles d'initiatives de transformation ont été adoptées, comme la réorganisation institutionnelle universitaire, la mise en place d'institutions et de programmes internationaux, comme l'Institut Agricole de Confucius, la mise en place de l'innovation d'agro-centres d'innovation collaborative à niveau national, et les nouveaux instituts de développement rural.*

Mots-clés. *La Chine – Agro-éducation supérieur – Développement modèle-défi.*

I – Introduction

The China's higher education in agricultural sciences was initiated over 100 years ago, but most of the agricultural universities in China were founded in 1950s that was during the major reforms of higher education system. As we know, there have been broadly two influential models of higher education around the world: the first model offers a broad and preferably comprehensive range of subjects which is extensively used in UK, USA and much of western continental Europe established institutions; the second model refers to institutions that specialized in one broad field. The Soviet Union actually became the most influential proponent by using this model (Liu *et al*.,

2015). In 1952, influenced by the Soviet Union's higher education developing model, the China's higher education system experienced a major reform, which separated comprehensive universities into different professional realms. They combined common realms from different universities into professional colleges and set up many agricultural institutions which specialize in one broad field. However, since the last quarter of the twentieth century, especially with the collapse of Soviet Union in 1991, the global specialized universities reconsidered their development orientations and took many measures to tangle development issues. This paper therefore focuses on the review of measures that were undertaken and achievements made by China's government and universities for the higher agro-education in the past 20 years and challenges to cope with from the perspective of transformative models.

II – Transformative measures undertaken

1. The modification of developing models

University merging is becoming an increasingly popular restructuring strategy for promoting efficiency, effectiveness, economy and competition in the higher education sector (Mok, 2002). Since the 1990s, the China's higher education system was also reconstructed again by modification. During this period, higher education institutions in agricultural sciences have adopted the following three models to develop to become more comprehensive (Liu *et al.*,2002):

1) Model A: A group of agro-universities (hereinafter denotes universities with agriculture, forestry or ocean in their names) were merged, such as China Agricultural University which was integrated by Beijing Agricultural University and Beijing University of Agricultural Engineering, and Northwest A&F University integrated by seven agro-colleges or institutions, etc.

2) Model M: Several agro-universities were merged into others to be comprehensive universities, such as Zhejiang Agricultural University that was merged into Zhejiang University, Shanghai Agricultural College into Shanghai Jiaotong University, etc.

3) Model S: There were also many universities that were able to keep their independence without merging but widening their subjects, such as Nanjing Agricultural University, Huazhong Agricultural University, etc.

It is approximated that the modification gave rise to the decreasing number of agro-universities from 62 in 1992 to 41 as at now (see Table 1). In this process, a number of large-scale, high-level, and comprehensive agro-universities with a relatively full range of disciplines were established. Independent agricultural universities were also able to develop into multidisciplinary institutions by internal enlarging the fields of subjects. The overall competitiveness of higher education in agricultural sciences has been promoted.

2. The reformation of administrative system

Successful efficiency initiatives in all sectors are characterized by corporate, government or sectoral "mandate". Mandate means that there is a defined and clear authority and leadership to request a particular course of action, make decisions, take responsibility for outcomes and instigate the change required in an organization or sector (Universities UK, 2011). In order to modify the inconsistent management of the central and local governments in higher education, and the overlapped administration of school running, a major reform on the administrative system of higher education was effected in 1990s. Formerly, higher agricultural education institutions were once attached to the China's Ministry of Agriculture, and they have been all detached from its administration since 2000. The current structure of China's higher agricultural education mainly includes

Table 1. List of agro-related undergraduate education institutions in China 2014†

Universities	Model	Administrator	Project 211	Project 985
China Agricultural University	A	E	+	+
Northwest A&F University	A	E	+	+
China Ocean University	S	E	+	+
Nanjing Agricultural University	S	E	+	
Beijing Forestry University	S	E	+	
Huazhong Agricultural University	S	E	+	
Northeast Forestry University	S	E	+	
Sichuan Agricultural University	A	P	+	
Northeast Agricultural University	A	P	+	
Shanghai Ocean University	S	P		
Anhui Agricultural University	S	P		
Southwest Forestry University	S	P		
Qingdao Agricultural University	S	P		
Beijing University of Agriculture	S	P		
Shenyang Agricultural University	S	P		
South China Agricultural University	S	P		
Heilongjiang Bayi Agricultural University	S	P		
XinYang College Of Agriculture And Forestry	S	P		
Shandong Agriculture And Engineering University	S	P		
Zhongkai University of Agriculture and Engineering	S	P		
Xinjiang Agricultural University	S	P		
Yunnan Agricultural University	S	P		
Dalian Ocean University	S	P		
Zhejiang A&F University	S	P		
Jilin Agricultural University	S	P		
Nanjing Forestry University	S	P		
Gansu Agricultural University	S	P		
Henan Agricultural University	S	P		
Hunan Agricultural University	S	P		
Shanxi Agricultural University	S	P		
Jiangxi Agricultural University	S	P		
Jilin Agricultural Science and Technology College	A	P		
Zhejiang Ocean University	A	P		
Hebei Agricultural University	A	P		
Tianjin Agricultural University	A	P		
Guangdong Ocean University	A	P		
Shandong Agricultural University	A	P		
Inner Mongolia Agricultural University	A	P		
Fujian Agriculture and Forestry University	A	P		
Central South University of Forestry and Technology	A	P		
Henan University of Animal Husbandry and Economy	A	P		

† Notes: “A” means institution has adopted model A (Agro-related universities merged) and “S” model S (Self-development university without merging); “E” means institution that is currently under the administration of the Ministry of Education; and “P” under the provincial government; “+” means the institution has been granted a “Project 211” or /and a “Project 985”.

(Data Source: Data retrieved on May 5, 2015 from introductions/about, official websites of above-listed universities).

two administrative models: universities managed either by central government or by provincial governments. Among them, nine agro-universities including China Agricultural University and Nanjing Agricultural University were transferred to and governed by the Ministry of Education. Eight other agricultural universities, including Shenyang Agricultural University, South China Agricultural University, etc. were shifted into and governed by the provincial/local governments.

After the reformation of the administrative system, many measures have been taken to boost China's agriculture through science & technology, education, and training. For instance, both the Ministry of Education and the Ministry of Agriculture signed the Agreement on Cooperation with Jointly Construct China Agricultural University and Seven Other Universities on May 27th 2009. Based on this agreement, the following 8 universities benefited from the two administrations backing up: China Agricultural University, Northwest A&F University, Nanjing Agricultural University, Huazhong Agricultural University, Southwest University, Jilin University, Shanghai Jiaotong University, and Zhejiang University. On June 4th 2010, the two Ministries jointly launched six measures for this purpose: (i) establish new cooperative mechanisms between agricultural and educational systems to build a group of agricultural colleges; (ii) encourage joint research projects and joint education programs at doctoral level between agricultural universities and related research institutions; (iii) set up a number of regional scientific and technological innovation demonstration centers for modern agricultural education; (iv) improve agro-disciplines, strengthen 23 innovative centers and 188 featured specialties for talent training, and transform 970 agricultural experiment stations into cooperative research and education centers; (v) extend the higher education in agricultural sciences to communities and individual farmers, and design tailor-made training programs according to the specific demand of communities and villages; and (vi) increase the policy support to key programs and speed up the pace to build world-class agricultural universities.

Up to now, there are three kinds of higher agro-education institutions in China, i.e. agricultural universities managed directly by the ministry of education, universities under the supervision of provincial or local governments and agro-faculty/college in comprehensive universities governed either by the ministry of education or by the provincial or local governments. The above structure not only fits the diversified conditions of China in rural regional differences, industrial and cropping structures, but also ensures the education and training of agricultural talents at all levels.

3. Granting to "Project 211" and "Project 985"

In almost all cases projects are initiated to create change –to develop new products, establish new manufacturing processes, or create a new organization. Without projects, organizations would become obsolete and irrelevant, and unable to cope with today's competitive business environment (Shenhar *et al*., 2001). In the 1990s, "Project 211" was launched by China's government, a project to build about 100 key universities and a group of key disciplines for the 21st century. It is a significant initiative to improve the development of higher education in order to catch up with the development of national economy and the society. This project is aimed to provide high-level research, high-quality talents for the strategic development of China, and has substantially contributed to improving the competence of China's higher education, speeding up the growth of China's economy, and promoting the development of science and technology. It also enhances the comprehensive national strength and international competitiveness of China and helps to achieve the mission of educating most of our top talents in China's universities. Nine agro-universities including China Agricultural University, Nanjing Agricultural University, etc. have been selected for "Project 211" since 1995 (See Table 1).

Later in the 1990s, China's government initiated the "Project 985", which was intended to construct a list of world-class universities and a group of world-renowned high-level research universities through setting up new management systems and operative mechanisms and catch up

with the strategic opportunities in the first 20 years of the 21st century. By centralizing the resources to highlight advantages and distinctions of China's higher education, China intends to build world-class universities with its characteristics. Ever since 1998, altogether 39 universities have been granted to participate in this project, 3 of which are agro-universities: China Agricultural University, Northwest A&F University, and China Ocean University (See Table 1).

4. Implementing the Plan of Top Agro-forestry Talents' training

In order to deepen the reform of higher education in agricultural sciences and to enhance the capability of higher education institutions to serve the needs in ecological civilization, agricultural modernization and rural development, the China's Ministry of Education, Ministry of Agriculture, and the State Forestry Administration Department jointly issued the Suggestions on Promoting the Comprehensive Reform of Higher Education in Agriculture and Forestry and the Suggestions on Implementing the Education and Training Plan of Top Agro-forestry Talents in November 2013. The objectives of this Plan are: firstly, to form a multi-level and diversified training system in agricultural sciences and a number of agro-disciplines with China's characteristics through innovating management systems and improving the ability of professional education and social service; secondly, to promote and demonstrate the innovation in talent training through improving 200 pilot projects for training top innovative talents, interdisciplinary professionals and skill-oriented professionals; thirdly, to focus on practical teaching through implementing 500 talent training centers of education and research in agriculture; fourthly, to build a stronger faculty team through the selection and employment of 1,000 teachers who are both capable of theoretical and practical teaching in order to improve the overall competence of talent training in the higher education of agricultural sciences.

In September 2014, the China's Ministry of Education, Ministry of Agriculture and State Forestry Administration Department determined the first 99 pilot universities and 140 pilot programs of the Education and Training Project of Top Agro-forestry Talents. 43 programs are devoted to training top innovative talents, 70 are devoted to training interdisciplinary professionals, and the rest 27 are for skill-oriented professionals. The Project is playing an important role in enhancing the comprehensive reform of higher education in agricultural sciences and improving the capability of professionals, and also provides new opportunities for the development of China's higher education in agriculture and forestry.

5. Optimizing the structure of agro-higher education

Structures of higher education systems or more precisely, the shape and the size of the national higher education systems have been among the issues of higher education policy in the economically advanced countries of the world which absorbed enormous attention for more than four decades (Teichler, 2006). Great changes have taken place in the structure of China's higher education in agricultural sciences under the national guidance on the direction of stabilizing the development of undergraduate education, giving priority to the development of postgraduate education and developing professional education properly. The postgraduate education has achieved great development, whereas the undergraduate and professional education has experienced stable growth. The ratio of postgraduates, undergraduates, and professional students has been optimized and is now comparatively stable. In 1992, the total enrollment of postgraduate, undergraduate and professional students of China's agricultural universities was 124,567, including 3.1% graduate students, 64.5% undergraduates, and 32.4% of professional program students. In 2013, the total enrollment increased to 490,533, roughly four times 20 years ago, including 12.4% postgraduates, 53.0% undergraduates, and 34.6% professional students. Compared with 1992, there is a notable increase in the percentage of postgraduate students, which meets with the pressing demand of the society for agro-postgraduates (See Fig. 1).

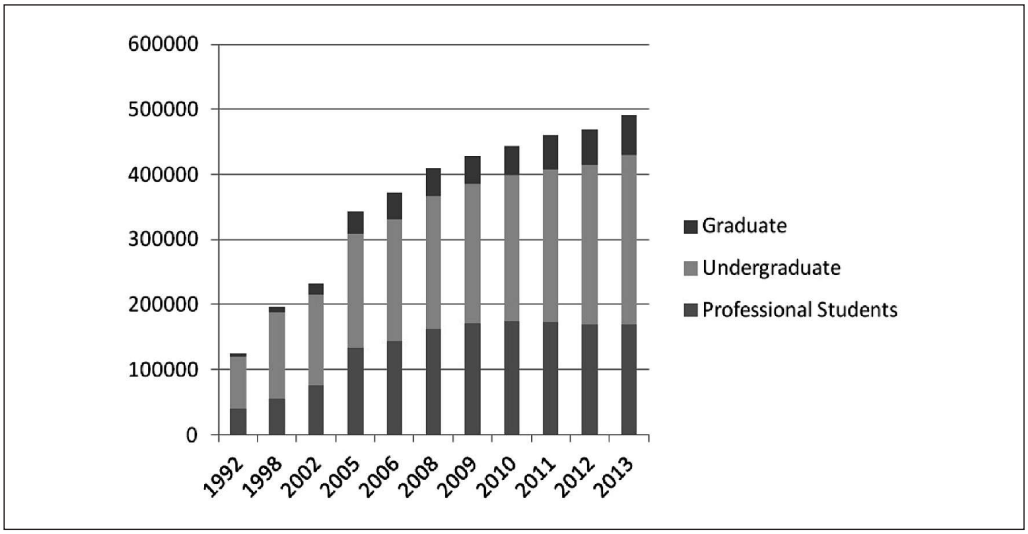

Fig. 1. Student's enrollment of China's agricultural universities from 1992 to 2013.

Source: Ministry of Education of People's Republic of China. Educational Statistic Data, retrieved on May 1st 2015 from: *http://www.moe.gov.cn/publicfiles/business/htmlfiles/moe/s8492/index.html*

It makes sense that through more than 20 years' development, the China's higher education in agricultural sciences is much more reasonable, with graduate education as its driving force, undergraduate education as essence, and professional education as implementation.

6. Establishing World-class Agro-universities

As a general rule, universities easily strive to attain top positions in their regions, countries or the world. Most of them have aligned their mission statements and objectives to those of world-class universities in the respective teaching and research areas (Lepori, 2007). As China is getting more and more involved in the world, China's higher agro-education institutions administrators begin to review their missions and visions from a global perspective in order to make greater contributions to human and social development. "Building World-class Agro-universities" is proposed and originated as the strategic objectives of some agro-universities. World-class Agro-universities represents World-class Universities with certain characteristics, which will be demonstrated by offering world-leading agro-education and research programs, hosting world-class researchers, teachers and students (both undergraduates and postgraduates) in agro-sciences; achieving world-class influences in agricultural production and related practical areas, and providing knowledge, technologies and talents for the agricultural development of the region, the country and the world.

On May 2, 2009, when the former President Hu Jintao of P.R.C visited China Agricultural University, he proposed a statement of "speeding up the pace of constructing World-class Agricultural Universities". This decision encouraged all the faculty and students from agro-universities. In the same year, China Agricultural University defined the specific objectives for establishing a World-class Agricultural University. In July 2011, Nanjing Agricultural University (NAU) also set up the objective of achieving to be a "World-class Agricultural University", and in September 2011, the university officially declared the strategic objective of achieving "World-class Agricultural University" and the related development requirements into NAU 12th Five-year Development Plan. In February 2012, the Decision on Accelerating NAU's Construction of a World-Class Agricultural University was

issued. Since then, most of China's leading agro-universities have their development strategies more focused on building world-class faculty team, achieving world-impact scientific research outcomes, cultivating leading talents and formulating a diversified campus culture.

Through the above measures, China's higher agro-education has achieved marvelous accomplishments in over the past 20 years. According to a recent ranking by US NEWS (Best Global Universities for Agricultural Sciences), four China's universities rank top 100 in the world: China Agricultural University (4), Nanjing Agricultural University (36), Huazhong Agricultural University (67), and Northwest A&F University (97), which are also ranked number 1, 3, 12 and 17 in Asia region respectively (U.S. News, 2014).

In addition, the QS World University Rankings by Subject 2015 (Agriculture and Forestry) ranks China Agricultural University as no.18 and three other universities (Beijing Forestry University, Nanjing Agricultural University Northwest A&F University) 50-100,respectively(QS, 2015).

From the NTU Ranking System (TOP 300 in Agricultural Field) from 2009 to 2014, it is easy to find out that three China's agricultural universities have made great progress in the recent years (See Fig. 2).

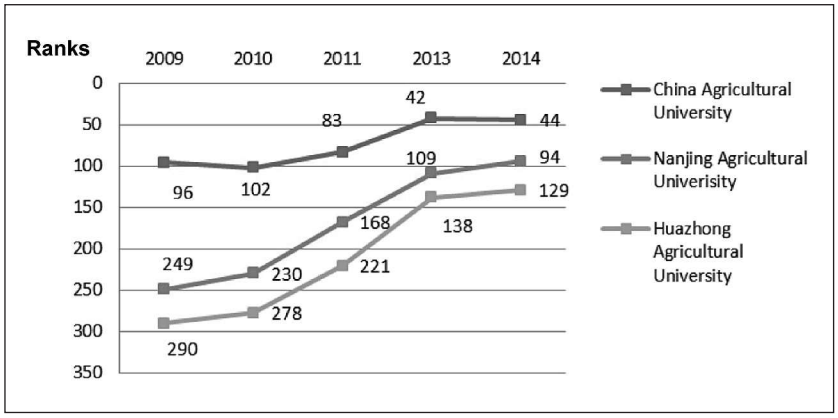

Fig. 2. Ranks of China's three agro-universities in NTU Ranking System (TOP 300 in Agricultural Field) from 2009 to 2014.

Data Source: Data retrieved on May 5, 2015 from Rankings by Field (Agriculture) in 2009-2014, National Taiwan University Ranking (NTU Ranking).
<http://nturanking.lis.ntu.edu.tw/DataPage/TOP300.aspx?query=Agriculture&y=2009>;
<http://nturanking.lis.ntu.edu.tw/DataPage/TOP300.aspx?query=Agriculture&y=2010>;
<http://nturanking.lis.ntu.edu.tw/DataPage/TOP300.aspx?query=Agriculture&y=2011>;
<http://nturanking.lis.ntu.edu.tw/DataPage/TOP300.aspx?query=Agriculture&y=2013>;
<http://nturanking.lis.ntu.edu.tw/DataPage/TOP300.aspx?query=Agriculture&y=2014>.
*Note: According to the NTU Ranking website, the ranking data in 2012 and 2010 are very much the same. In the Figure, data in 2012 have been omitted supposing they have been duplicated from 2010.

Nevertheless, to be a World-class University in Agricultural Sciences, achieving top 1% of global rankings on agro-subject areas (top 20) and top 1% of global rankings for universities (top 500) is necessary (Liu *et al*., 2015). It can be easily found that great gaps are still remaining between China's first-rate agricultural universities and those of world's famous comprehensive universities

specialized in agricultural sciences, such as UC-Davis, Cornell University, Wageningen University, UCB, Texas A&M University, Swedish University of Agricultural Sciences etc. There is a long way to go for the dream of China's World-class Agricultural University.

III – Challenges to confront

Nowadays, globalization widely exists in the economy, society, education and many other aspects. It calls for interdisciplinary researchers with more international communications and collaborations in order to cope with climate change, food security, human sustainable development and other world key issues. Under the new circumstances, every agro-university in China confronts the following challenges:

First of all, how to keep the balance between characteristics and comprehensiveness in university's development strategies? Comprehensive development is a fundamental requirement for higher education as a whole, while agro-disciplines represent the distinctiveness and basis of higher education in agricultural sciences. In the ideal organization, management would be equally adept at performing two somewhat conflicting functions: it would be able to create an administrative system (structure and processes) that could smoothly direct and monitor the organization's current activities without, at the same time, allowing the system to become so ingrained that future innovation activities are jeopardized. Such a perspective requires the administrative system to be viewed as both a lagging and leading variable in the process of adaptation (Miles *et al*.,1978). Therefore, the comprehensive development strategy of an agro-university should be guided by and in accordance with featured strategies on distinctiveness. In other words, the further development of a university should be breakthroughs in specific academic fields. Since 2011, Nanjing Agricultural University has integrated its 19 colleges into 5 academic groups in order to promote interdisciplinary collaborations.

Secondly, how to promote the internationalization of China's agro-universities? Currently, global higher education institutions are inevitably involved in the intense competition. It is compulsory for China's higher agro-educational institutions to push forward internationalization process with great passion and dedication. Internationalization has a positive impact on promoting academic communications, elevating education level, strengthening competitiveness, enriching the students' learning experience, increasing competitive advantages and enhancing the reputation of the university at a global level. The internationalization of China's higher agro-education institutions kicked off relatively late, with existing problems such as smaller scale, incomplete education structure, limited foreign language level of both teaching faculties and students, lower diversity in the country origins of international students, inflexible management model of international students, limited funding sources other than the government, less attractive featured courses, and low international reputation of universities.

Recruiting teachers with international background, expanding the enrollment of international students from more countries, offering more courses in English, acquiring more international evaluation and recognition of disciplines, and setting up international collaborative research centers and technology transfer centers have become common practices among many agricultural universities of China. Based on their international collaboration status, different agro-universities have launched various kinds of international activities. In order to promote the communication and collaboration in agricultural education, and to carry out the research on African agriculture while promoting agricultural technologies, Nanjing Agricultural University and Egerton University have jointly launched world's first Agricultural Confucius Institute in Kenya. Nanjing Agricultural University has also strengthened the collaborations with international organizations through initiating GCHERA World Agriculture Prize and hosting the "World Dialogue on Agricultural and Life

Science Education and Innovation". Northwest A&F University has started the annual session of "Yangling International Agro-science Forum". Through the establishment of international colleges. China Agricultural University, Huazhong Agricultural University etc. have carried out various forms of collaborations, such as joint degree programs with universities in Europe, the United States, Canada and other countries and regions.

Thirdly, how do we meet the social needs given rise to the modern agriculture? Modern agriculture signifies itself by widely applying modern technologies. It utilizes all means of production provided by modern industry and scientific management approaches and is supported by socialized service systems and nice ecological environments. The development of modern agriculture depends on the dissemination of the environmental-friendly concept, the advances in technologies as well as the contribution of well-trained professionals. Higher education institutions in agricultural sciences are expected to redefine their missions in order to educate more outstanding professionals in related fields and promoting new multidisciplinary collaborations in agricultural science, in order to contribute to the further development of modern agriculture. Both Henan Agricultural University and Hunan Agricultural University have separately led the establishment of national collaborative innovation centers of food crops and oil crops with agricultural research institutions and industrial organizations, which provide intellectual support for national food security. Professors from agro-universities have become the think tank for the government in coping with climate change, food security and sustainable development issues. Supported by "Program of New Rural Development Institutes", "Program of Outstanding Talents in Agriculture and Forestry" and other domestic projects, China's agro-universities have been working on establishing classified cultivation of talents, promoting the integration of different subjects, and providing talents for serving rural areas, farmers and agriculture.

IV – Conclusions

From the above discussion, the following conclusions can be drawn:

In the past twenty years, a lot of measures have been undertaken in driving the development of China's higher agro-education, such as modification of developing models from the unique agricultural institution specialized in one broad field to a comprehensive one with a wide range of subjects either by merging or self-development; reformation of administrative system from specific sector to ministry of education or provincial administration; granting to Project "211" (nine agro-universities granted) or/and Project "985"(three agro-universities granted); implementing the Plan of Top Agro-forestry Talents' Training and optimizing the structure of agro-higher education to satisfy the social needs; encouraging some domestic top-agro universities to establish world-class universities in agro-science. A preliminary achievement has been made: three China's agricultural universities' ranks keep rising in the recent years while they started their destinations as World-class Agro-universities, but a large gap still remains as compared with their counterparts in other countries. Under the new situation, China's agro-universities confront many new challenges they have to cope with: balance of characteristics and comprehensiveness, internationalization and meeting the social needs, etc. Initiative transformative models have been adopted to cope with the uprising problems, such as university institutional reorganizing, setting up overseas joint institutions or programs, as the said Agricultural Confucius Institute, establishment of national collaborative innovation centers for agriculture, the Program of New Rural Development Institutes etc.

Acknowledgments

We wish to acknowledge the enormous input of Simon B Heath, Simon K. Kipchumba, Hongsheng Zhang and Wei WEI for proof reading the work, Xiaoguang LIU, Yingshuang WANG, Guoyu LIU and Jiaming YUAN for collection of data and Sowadan Ognigamal for translating the abstract from English to French.

References

Lepori B., 2007. *University ranking: Policy and value choices* [online]. [Consulted in May 2015]. http://www.universityrankings.ch/information/literature/pdf/5.

Liu Z. and Liu C., 2015. On the World Benchmark of the High-level Universities with Clear-cut Professional Characteristics. In: *Researches in Higher Education of Engineering* (Chinese Journal with English abstract), 1, p. 56-61.

Liu Z., Kipchumba S. and Lu L., 2015. Paths for world-class universities in agricultural science. In: *Higher Education*, DOI 10.1007/s10734-015-9891-9.

Liu Z., Chen W., *et. al.*, 2002. The development models of higher education institutions in agriculture models [J]. In: *Higher Agricultural Education* (Chinese Journal with English abstract), 11, p. 15-18.

Miles R., Snow C., Meyer A. and Coleman H.J., 1978. Organizational Strategy, Structure, and Process. In: *The Academy of Management Review* 3(3), p. 546-562.

Mok K.H., 2002. Globalization and university merging: International Perspectives. In: *Paper presented at the International Conference on University Merging,*Tamkang University, Taipei (in China's).

QS.Top Universities, 2015. *QS World University Rankings by Subject 2015 - Agriculture & Forestry* [online]. [Consulted in May 2015]. http://www.topuniversities.com/university-rankings/university-subject-rankings/2015/agriculture-forestry#sorting=rank+region=+country=+faculty=+stars=false+search=.

Shenhar A., Dvir D., Levy O. and Maltz A.C., 2001. Project success: a multidimensional strategic concept. In: *Long range planning,* 34(6), p. 699-725.

Teichler U., 2006. Changing structures of the higher education systems: The increasing complexity of underlying forces. In: *Higher Education Policy*, 19(4), p. 447-461.

Universities UK, 2011. Efficiency and Effectiveness in Higher Education: A Report by the Universities UK Efficiency and Modernisation Task Group. ISSN: 978-1-8403-6260-2. United Kingdom.

U.S. News&World Report, 2014. Best Global Universities for Agricultural Sciences [online]. [Consulted in May 2015]. http://colleges.usnews.rankingsandreviews.com/best-colleges/search?name=Best+Global+Universities+for+Agricultural+Sciences&location.