

THE STATE OF INNOVATION IN COFFEE VALUE CHAINS AND POLICY IMPLICATION PROMOTING INNOVATION

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Abstract:

This study provides some initial review of demand and directions for innovation in coffee value chain (coffee enterprises and farmers in the enterprises' value chain), the manner of interactive learning to enhance innovation capacity; and interaction among coffee enterprises, coffee farmers (production system), agricultural research system, extension system and education system. Finally, the study proposes policy implications to promote innovation.

Keywords: Innovation system; Agriculture; Coffee; Policy; Interactive learning.

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1. Introduction

Vietnam agriculture is facing challenges in numerous aspects: holding growth trends, enhancing efficiency rate, productivity, quality and added values of agricultural commodities; improving international competitive capacities, meeting demands, preference styles and increasing requirements for quality and food safety of consumers of both domestic and export markets, controlling diseases/insects during cultivation process, forecasting market price fluctuation, improving incomes and living conditions of rural farmers, assuring food and nutrition security; reducing poverty rate, mitigating environment pollution and responding to climate change. Agricultural sector needs to base actions on innovation initiatives to overcome the actual challenges. An effective innovation system in agricultural sector with comfortable environment for forming innovation initiatives which has been recognised worldwide will be resource platforms for enhancement of productivity, competitiveness, economic growth, offer of new jobs, higher incomes, reduction of poverty and sustainable development. Actually, however, there is not obviously many studies in Vietnam for innovation systems in agricultural sector.

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This paper makes a study on the topic of innovation system in coffee sector with focus on assessment of the state of innovation activities and proposal of policies to promote the innovation system in the sector. The paper will provide answers to the following aspects:

- Needs and directions of innovation in the value chains of coffee sector (upgrading production processes, products, operational functions and chains);
- Forms of learning and enhancement of innovation capacities of enterprises and farmers in sectoral value chains of enterprises;
- Interactions between enterprises/farmers and systems of agricultural research, extension, technology transfer, education and training in the sector; and
- Recommendation of policies to promote innovation.

2. Analysis frame for innovation system for agricultural sector

The promotion of innovation in value chains of coffee sector requires enhancement of innovation capacities of enterprises, farmers and farmer associations (team, group, cooperatives and etc.) in the value chains. Innovation capacities would help enterprises, farmers and farmer associations carry out necessary upgrading moves for development of value chains. Forms of upgrading moves include processes, products, operational functions and chains (*Kaplinsky & Morris, 2001*). Innovation capacities include coffee related specific skills and other soft skills needed for innovation. Regarding qualification level of labours in enterprises, the innovation capacities include skills for investment, production, creation of utilities, marketing, linkage, new technologies and etc. Regarding the plan for farmers and farmer associations, the innovation capacities include skills of specific operations, settlement of problems, organization of production activities and etc. They would get innovation capacities through various forms of learning which include on-job learning (exchanges and training), learning through recruitment of human resources, learning through searching and learning through linkages with overseas partners. The innovation system plays important roles as supports for forms of learning and enhancement of innovation capacities.

This paper applies the analysis frame for innovation systems developed by the World Bank. The innovation system in agricultural sector is a network of organizations and individuals participating in process of realization, application and commercialization of novel procedures, products and production organization schemes in agricultural production and business as

well as a system of institutions and policies which affects behaviours and effectiveness of these actors. As indicated by the World Bank (2012) and (2016), the agricultural innovation systems have some main components including systems of agricultural science and technology (S&T), agricultural extension and technology transfer services, education and training, production and business activities.

In views by World Bank, the higher efforts of investments for S&T, agricultural extension, technology transfer, education and training in agricultural sector as well as stimulations for linkage between these activities are necessary but not enough. The approach for sectoral innovation system needs to combine the traditional intervention (supports for research, agricultural extension, education and creation of links between research/extension/education and enterprises/farmers) with supplementary interventions required for innovations to occur. They include enhancement of innovation capacities, offer of stimulating mechanisms, higher resources to promote cooperation for innovation and business development by enterprises, enhancement of innovation capacities for farmers, offer of comfortable environment for agricultural innovation, organization of assessment activities, and offer of priority measures and monitoring of innovation systems in agricultural sector.

Agricultural S&T systems are the original resource of new knowledge which leads to novel products, services, technical practices and management systems for enhancement of productivity, quality and added values. The S&T systems in the agricultural innovation system need to enhance capacities, offer priorities for designing works, link customer needs and build up effective cooperative institutions.

The system of agricultural extension and technology transfer is a highly necessary component for the sectoral innovation system. It has new roles such as agricultural extension², intermediation for innovation³ and service for development of local agricultural business⁴. The enhancement of capacities for agricultural extension staff is necessary for them to carry out the new roles of the agricultural extension system.

² Extension+ is the form of enhancement and reform of the roles of agricultural extension to become a strong partner and a hub in the innovation system to supply technical and non-technical services for farmers. The purpose of Extension+ is the enhancement of the roles of agricultural extension to play the roles of interlinking actor (no more a simple actor of agricultural technology transfer) and, at the same time, the enhancement of capacities of other actors in the innovation system to provide producers with supports in the most integrated way (system integrated).

³ Innovation intermediation is the catalyzing action for a well purposed innovation process by bringing partners closer and promoting interactions between them.

⁴ Service of development of local agricultural business is the consulting service for small size production households, farmer associations and small size agricultural enterprises in various aspects such as market access, finances, input services, technical knowledge and etc.

The system of agricultural education and training plays the main roles in building and enhancing capacities for agricultural extension as well as training human resources for the sectoral innovation system. In addition to provision of specific knowledge and skills, the activities need to offer soft skills for innovation.

The system of agricultural production and business (agricultural enterprises and farmers) needs to promote mechanisms and resources for participation in S&T research cooperation, technology transfer and cooperation for business development. Particularly for farmers, it is necessary to enhance innovation capacities for farmer associations, participation of farmers in small scale production activities and their involvement in modern value chains of enterprises.

3. Methodology of study

This study applies the qualitative method where the in-depth interviews are conducted with representatives of coffee value chain leading enterprises, organizations in the systems of agricultural research, technology transfer, education and training as well as concerned state administration organizations in coffee sector. In addition to primary data collected during in-depth interviews, the study also uses secondary data provided by enterprises, related organizations and other well reputed sources such as Vietnam Coffee Coordinating Board (VCCB).

The scope of research of the value chains by this study is limited in the level of enterprises and farmers involved in the value chains of enterprises.

The geographical limits of this study are focused on Dak Lak Province which is in fact the heart of coffee production of High Lands of Vietnam.

4. Survey sample

Interviews were conducted with Nestlé Vietnam Ltd. Co. (High Lands Branch), Dak Lak September 2 One-member Ltd. Co. (Simexco), G20 COFFEE Ltd. Co. (G20), UTZ Certification Organization (UTZ), Western Highlands Agro-Forestry Scientific and Technical Institute (WASI), Institute of Biotechnology and Environment (IBE) and Faculty of Agriculture-Forestry (FAF) of Tay Nguyen University (TNU), Science-Technology Department (Dak Lak Province) (DL STD), Agriculture and Rural Development Department (Dak Lak Province) (DL ARDD), Dak Lak Agricultural Extension Center (DL AEC) and Vietnam Coffee Coordinating Board (VCCB). Table 1 presents the list of the surveyed organizations, survey samples and status classification.

Table 1. List of the survey organizations

No.	Surveyed organizations	Organizational groups				
		Coffee enterprise	Research system	Transfer system	Training system	State administration status
1	Nestlé Vietnam	X				
2	Simexco	X				
3	G20	X				
4	UTZ			X	X	
5	WASI		X	X		
6	DL AEC			X	X	
7	TNU				X	
8	DL STD					X
9	DL ARDD					X
10	VCCB			X		

Source: Study team members

5. Main results of innovation in coffee value chains

5.1. Needs and directions of innovation in coffee value chains

Table 2 summarizes the actual directions of innovation in the coffee value chains. The directions of innovation are divided into three groups of main efforts for upgrading: procedure, products and operational functions. The directions of innovation are also different between coffee enterprises and coffee growers.

Table 2. Needs and directions of innovation in coffee value chains

Needs/Directions	Coffee enterprises	Coffee growers
Upgrading of procedure ⁵	ISO ⁶ TPM ⁷ Lean Manufacturing Continuous Improvement	Practice of sustainable coffee production (NSC ⁸ , NBFP ⁹) Mechanization of production process (harvesting, processing, storing)

⁵ Upgrading of procedures is the transformation of inputs to outputs in a more efficient way through improvement of production organization and application of advanced technologies.

⁶ International Standardization Organization

⁷ Total Productivity Management

⁸ National Sustainability Curriculum for Coffee

⁹ Nestle Best Farming Practice

Needs/Directions	Coffee enterprises	Coffee growers
	Automation	Application of high techs (MimosaTEK, GREENcoffee, WeGap, use of vegetable protection chemicals) View of sustainable coffee garden Cooperatives
Upgrading of products ¹⁰	Coffee (Arabica/Robusta, high quality, sustainable, organic, specialty and etc.) Instant coffee (high quality) Coffee roasted and ground (high quality, sustainable, organic, specialty and etc.) Decaffeinated coffee Coffee ready to drink Coffee Capsule, Nespresso Coffee extraction	Coffee Arabica/Robusta High quality coffee beans Sustainable coffee beans (UTZ, Rainforest Alliances, 4C, FairTrade and etc.) Organic coffee beans Specialty coffee
Upgrading of operational functions ¹¹ (mainly local enterprises)	Business, export OEA ¹² OEM ¹³ ODM ¹⁴ OBM ¹⁵ Retail sales (shops, super markets, trade centers, restaurants) Chains of cafes	

Source: Summary from interviews by the study team members

¹⁰ Upgrading of products is the enhancement of quality of existing products and shift to the segment of higher class products and diversification of assortments of products.

¹¹ Upgrading of operational functions is the shift to operational segments which require more skills, experiences and produce higher added values.

¹² OEA (Original Equipment Assembly) is the type of fabrication contracts where local enterprises receive from partner companies coffee materials and necessary auxiliary materials (including packages) and then their works are simply *to package* ready products according to requirement of partner companies.

¹³ OEM (Original Equipment Manufacture) is the type of fabrication contracts where local enterprises receive from partner companies *orders for fabricating and processing of products according to requirements of partner companies* which do not supply main materials, auxiliary materials and packages. Local enterprises themselves take care of these items and then sell ready products under trademarks of partner companies. Local enterprises and partner companies are independent partners.

¹⁴ ODM (Original Design Manufacture) is the form of cooperation where local enterprises are hired by partner companies *to set up the formula for products according to ideas of partner companies*; the involvement of local enterprises covering a large range of levels upon negotiation between the sides. Once the designed samples get sold the ordering companies own them totally and the ODM enterprises are not allowed to manufacture similarly designed sets of products without permission from ordering companies.

¹⁵ OBM (Original Brand Manufacture) is the form where OBM companies *make orders suppliers, put their trademarks on products and then distribute products to end users*. Another option is the full operations by OBM companies from industrial designs, production, marketing, sales and distribution of produced commodities with their trademarks.

5.1.1. Coffee enterprises

According to the view by enterprises, it is necessary to apply procedures and tools of enterprise management to improve efficiency of activities, reduce wastes and enhance productivity and quality. Nestlé Vietnam is in advancing positions in these activities. All the plants of Nestlé Vietnam apply TPM. Regarding the management of coffee supply chains, Nestlé Vietnam applies the system Agriculture Supplier Development (ASD) Lean.

Enterprises also agree that it is necessary to diversify products and upgrade quality of processed coffee products in order to improve competitiveness and to increase added values. Each enterprise has its own strategies to upgrade its products. Nestlé Vietnam makes focus on development of Decaffeinated, Capsule, Nespresso products and organic coffee (Nestlé had bought the organic coffee facility of Starbuck in Cau Dat, Lam Dong Province). Simexco still makes focus on high quality coffee beans. G20 makes focus on processing coffee extractions (instant coffee blended with other ingredients). This business was massively invested because it offers the largest margins of benefits.

Local coffee enterprises are also implementing activities to upgrade operational functions to target activities with higher added values. Simexco, traditionally being a big figure in export of coffee beans, enters the segment of roasted coffee. G20 has entered the segment of instant coffee and roasted coffee.

5.1.2. Coffee growers

Directions of upgrading of procedures by farmers are oriented to acceleration of practice of sustainable coffee production, application of high techs and better organization of production procedures. Practice of sustainable coffee production is a set of numerous upgrading actions including management of input agricultural materials, cultivation of new coffee varieties, integrated agro-forestry culture, economical watering, balanced fertilizing, use of organic fertilizers and micro-biological products, integrated control of diseases/insects, good practice of harvesting/processing/storing operations of coffee beans.

Many advanced practices of high techs were applied for coffee production. Models of drop watering come from MimosaTEK technologies. GREENcoffee is a project to supply information for 100,000 coffee growers which target higher productivity, incomes and food security. UTZ, a partner of the GREENcoffee project, is integrating Internal Management System (IMS) with sustainable coffee supply chains according to UTZ standards on platform of apps by GREENcoffee. WeGap is a mobile phone app which is applied by Nestlé Vietnam to provide farmers with weather information and Technical Manual for Coffee Cultivation.

Another direction of upgrading in coffee sector is the organization of production operations for teams of coffee growers up to become cooperatives. Coffee enterprises all agreed it is needed to build up cooperatives but each enterprise has its own choice of time with better supports for farmers in the chain.

5.2. Forms of learning and capacity enhancing in coffee value chains

Table 3 summarises the forms of learning and innovation capacity enhancing for enterprises and farmers in coffee value chains of enterprises. There are four forms of learning and innovation capacity enhancing, namely: on-job learning, learning through recruitment of labours, learning through training (on-site and out-job) and learning through searching. The forms of learning and capacity enhancing are also different between staff of coffee enterprises and farmers.

Table 3. Forms of learning and capacity enhancing by enterprises and farmers in coffee value chains

Forms of learning	Coffee enterprises	Coffee growers
On-job learning	<ul style="list-style-type: none"> • Training courses inside enterprises on procedures and tools for effective management of enterprises such as ISO, TPM, lean production, continuous improvement and automation. 	<ul style="list-style-type: none"> • Training courses for team chiefs of farmers on presentation skills, communication skills and sharing of experiences from projects; • On-field presentation of experiences of excellent farmers directly in coffee gardens); • Sharing of success experiences and knowledge in magazines and forums.
Learning through recruitment of labours	<ul style="list-style-type: none"> • Career introduction programs and linkage with universities; • Searching of high quality human resources through recruitment companies; • Searching and building of high qualified expert networks for consulting services; • Transfer of knowledge and technologies through contracts signed with input service suppliers (for high techs). 	
Learning through training activities (on-site training and out-job training)	<ul style="list-style-type: none"> • Short/long term training courses for staff inside enterprises in conformity to their career orientations and needs of enterprises; 	<ul style="list-style-type: none"> • Building of models of show; • On-field workshops; • Study tours; • Annual training courses for

Forms of learning	Coffee enterprises	Coffee growers
	<ul style="list-style-type: none"> • Supports for staff to follow post-graduate education and higher grades; • Supports for research activities in conformity to direction of development of enterprises; • Offer of opportunities of staff to follow out-job training courses and workshops. 	farmers for repeating and upgrading of knowledge.
Learning through searching	<ul style="list-style-type: none"> • Building and digitization of databases for easy access by enterprise staff and farmers; • Building of information gates; • Searching and building of expert network for consulting services. 	

Source: Summary from interviews by the study of team members.

5.2.1. Coffee enterprises

For on-job learning, Nestlé Vietnam holds numerous training courses for staff inside enterprises on procedures and tools of management such as Agriculture Supplier Development (ASD) Lean, TPM. Nestlé also invites external consulting organizations for lessons of soft skills such as leading skills, competing skills and etc.

For learning through recruitment of staff, Nestlé Vietnam conducts a career introduction program in linkage with universities. Simexco search’s experts through a network of individual links and input technology suppliers (for example, Simexco hired experts from MimosaTEK when implementing the application of MimosaTEK technologies). G20 recruited staff through job promoting centers and universities.

For learning through training (on-site training and out-job training), Nestlé Vietnam conducts long term training programs for development of human resources inside the corporation. Besides, Nestlé Vietnam develops support packages and scholarships to train experts for the corporation. Nestlé Vietnam makes links with overseas universities to develop research and training activities for human resources of the corporation. Simexco develops short term training courses for staff. G20 conducts monthly training courses for workers with focus on processing procedures for higher quality processing procedure and better storing practice.

For learning through searching, Nestlé Vietnam builds digital databases for mobile apps (WeGap) for easy access by enterprises and farmers. The apps include Diaries of households for sustainable coffee production, Techniques of production of Robusta coffee, Guiding instruction for sustainable coffee production. G20 builds the information gate (www.tincaphe.com) where coffee prices, large range of information and on-line graphics are provided.

5.2.2. Coffee growers

For on-job learning, Nestlé Vietnam invites consulting teams to conduct training courses on soft skills for farmers such as presentation skills, communication skills and sharing of experiences from projects. Nestlé Vietnam also builds models of case-study in high productivity coffee gardens where their experiences and success are shared for visitors. Simexco holds training courses with special topics for farmers. For selection of topics and right choice of instructors, surveys are conducted to gather needs of farmers. G20 demonstrates the benefits a coffee grower can get if he follows the standards indicated by enterprises. Training courses are also conducted for purpose of illustration and evidence.

For learning through training, enterprises hold annual training courses, demonstration shows of models, implementation of on-field workshops and organization of study tours for farmers.

5.3. Interaction between enterprises/farmers and the systems of agricultural research, extension and education-training in innovation systems

Table 4 summarizes forms to support learning and innovation capacity enhancing for staff of enterprises and farmers in coffee value chains of enterprises. Support activities in majority have coordination between enterprises and organizations in innovation systems.

Table 4. Interaction between enterprises and the systems of agricultural research, extension and education-training in innovation systems

Forms of learning	How do organizations of agricultural research, extension, education-training and services provide supports for promotion of forms of learning and innovation capacity enhancing?	
	Coffee enterprises	Coffee growers
On-job learning	<ul style="list-style-type: none"> • Training courses inside enterprises on procedures and tools for effective enterprise management (e.g. UTZ supports enterprises in implementation of IMS systems). 	<ul style="list-style-type: none"> • Training courses for team chiefs of farmers on presentation skills, communication skills and sharing of experiences from projects; • On-field presentation of experiences of excellent farmers directly in coffee gardens); • Sharing of success experiences and knowledge in magazines and forums (e.g. VCCB).
Learning through recruitment of labors	<ul style="list-style-type: none"> • Training of high quality human resources; • Training of high qualified experts for consulting services (e.g. UTZ Academy Online masters). 	

Learning through training (on-site training + out-job training)	<ul style="list-style-type: none"> • Programs of post-graduate education; • Financial supports for research or scholarships; • Out-job training courses and workshops for capacity enhancement (e.g. VCCB, provincial S&T departments). 	<ul style="list-style-type: none"> • Building of models of show; • On-field workshops; • Study tours; • Annual training courses for farmers for repeating and upgrading of knowledge.
Learning through searching	<ul style="list-style-type: none"> • Building of digital databases with apps for easy access by enterprise staff and farmers; • Building of information gates (e.g. diendankhuyennong@). • Searching and building up of the network of links with high qualified experts. 	

Source: Summary from interviews conducted by study team.

Vietnam Coffee Coordinating Board (VCCB) is the organization which represents both the coffee public and private sectors. The Board makes considerable contributions in building up and developing the overall visions and strategies of coffee sector, coordinating and identifying priorities and agendas for problems of the sector, promoting the coordination and exchange of information, knowledge, technologies and resources between partner members and lobby for policies.

UTZ is the organization which operates to issue certification of sustainable coffee business and to transfer knowledge and information to customers. Enterprises participating in the UTZ certification activities are all the members of UTZ. Annually, UTZ holds IMS training courses for enterprise staff on issuance of certificates. UTZ has about 300 IMS instructors in enterprises and connections to 50,000 farmers. Even without direct training activities for coffee growers UTZ considers that it is necessary to change the training practice for farmers. Farmers want to get short term training courses with simple and vive illustrations and feedbacks to meet demands and concerns of farmers.

Western Highlands Agro-Forestry Scientific and Technical Institute (WASI) coordinates with coffee enterprises (including Nestlé Vietnam and Simexco), fertilizer enterprises (including Binh Dien, Dam Ca Mau and Dam Phu My), agricultural chemical enterprises (including Syngenta and Bayer), certificate issuing organizations (including UTZ and Rainforest Alliance), NGOs (including SNV¹⁶ and CDC¹⁷) and universities. With enterprises, WASI conducts the form of cooperation through the transfer of technologies and techniques. WASI, together with enterprises, prepares

¹⁶ Netherlands Development Organization.

¹⁷ Community Development Center.

topics and documents for on-field workshops and builds up models of show. With universities, WASI develops cooperation in training activities where annually students have practice courses and pass post-graduate training programs.

The Provincial Extension Center cooperates with enterprises to organize short term training courses ordered by enterprises. The Extension Center cooperates with Nestlé Vietnam to supply seedlings for farmers to complete re-plantation plans during the last three years. The Extension Center also keeps roles to coordinate production of seedlings and transfer of techniques and training works for farmers. Nestlé Vietnam provides yet finances to support farmers in the material producing zones of Nestlé Vietnam. In addition to cooperation for implementation of pilot models the Extension Center provides information and keeps a website for propagation and transfer of technical advances where farmers can easily access to agricultural technical advances.

Tay Nguyen University has two units - Institute of Biotechnology and Environment (IBE) and Faculty of Agriculture-Forestry (AFA) - to conduct direct participation in coffee related training, research and technology transfer activities. FAF is in charge to train students in coffee planting, cultivating and processing operations. The Faculty has post-graduate programs where students can do in-depth researches for nutrition and disease/insect control aspects. Actually, FAF does not have yet official cooperation mechanisms with enterprises but teaching staff, through their own individual links, provide consulting services for farmers of enterprises. Tay Nguyen University develops cooperation with VnSAT Project¹⁸, vocational centers and agricultural extension centers to conduct training courses in framework of cooperation programs.

6. Conclusion

This study provides analysis of actual needs and directions of innovation in coffee value chains, forms of learning and innovation capacity enhancing, interaction between coffee enterprises/farmers (as production system) and systems of agricultural research, agricultural extension and education-training. They together create an sectoral innovation system. The coffee sector is highly dynamic and rich with innovations and forms of learning between organizations and individuals in the innovation system.

On the basis of that, some recommendations are proposed to promote further innovation in coffee sector, namely:

¹⁸ Vietnam Sustainable Agriculture Transformation Project

- Enhancement of capacity for VCCB. VCCB needs to get a budget enough to coordinate and build up an effective operational network with higher skills for coordination and communication works, provision of information and implementation of research, agricultural extension and education-training works between partners;
- Assessment of needs of coffee production and business enterprises, building up of specific training programs for coffee planting, production, business, trade, processing, export activities and other soft skills (communication skills, team work skills, leading skills, organizing skills and etc.) in coffee related activities;
- Enhancement of capacity for agricultural extension staff up to the Extension+ level, innovation intermediation and business development service in coffee sector;
- Higher participation of coffee enterprises and farmers in S&T activities through research based access of beneficiaries and co-design approach; enhancement of capacity for researching staff in some specific aspects such as analysis and forecast of coffee markets and other soft skills for scientific research, coordination, consulting and etc.;
- Measures to stimulate coffee enterprises to participate in S&T research, technology transfer, business cooperation through consulting service for business development in coffee sector, supports for incubators, enhancement of roles of technology transfer offices and activation of public-private partnership links;
- Enhancement of participation of coffee growers in sustainable coffee value chains of enterprises which can be made through supports for establishment of farmer associations (production groups, cooperatives and etc.), supports for development of infrastructure and specific machines/equipment, enhancement of capacity of farmers and farmer associations to meet standards of sustainable production, provision of market information and forecast, financial-technical supports for team chiefs of farmers and bottom-up approach for identification of needs of farmers for training courses./.

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