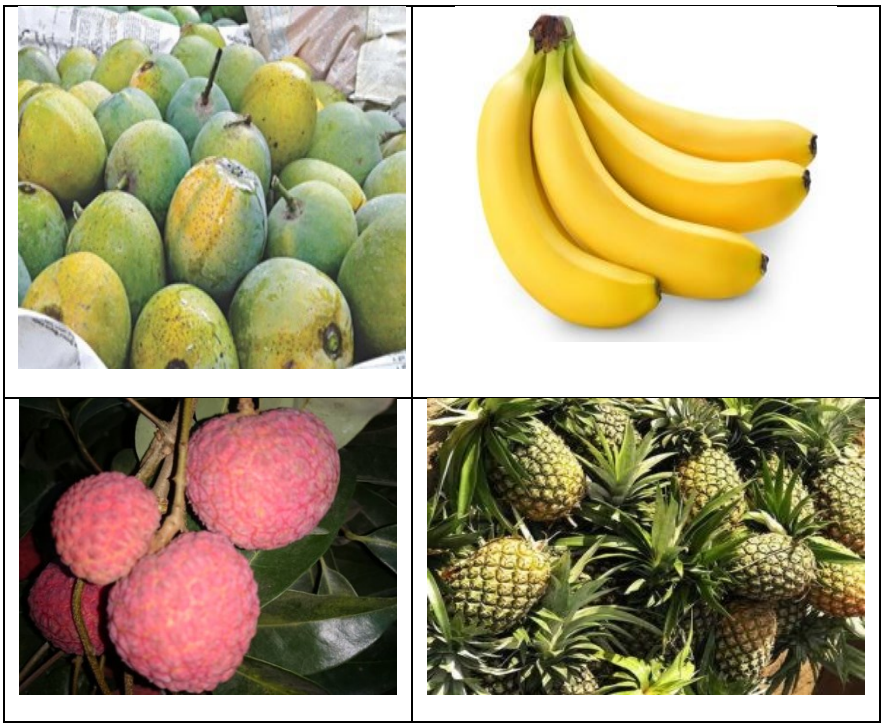
COMMON SERVICES ACTIVITIES, TECHNOLOGICAL AND ENVIRONMENTAL INTERVENTIONS REQUIREMENT FOR FRUITS (MANGO, LITCHI, BANANA, PINEAPPLE) SUB-SECTOR



Sustainable Enterprise Project (SEP)
Palli Karma-Sahayak Foundation (PKSF)
Plot-E-4/B, Agargaon Administrative Area
Sher-e-Bangla Nagar
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BANGLADESH

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By

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EXECUTIVE SUMMARY

PKSF in collaboration with the World Bank is in the process of designing a micro enterprise development project titled "Sustainable Enterprise Project (SEP). The goal of this project is to increase the adoption of environmentally sustainable practices by targeted microenterprises (MEs). The proposed project will support microenterprises in agribusiness and manufacturing clusters with a focus on areas that are environmentally stressed and/or vulnerable to climate change and natural disasters. To assist the design process, PKSF has decided to study on common services analysis, technological intervention and environmental intervention required for fruit (Mango, litchi, banana and pineapple) sub-sector. The present study is, therefore, designed to study the common services analysis, technological and environmental interventions required for fruit (Mango, litchi, banana and pineapple) sub-sector to make the sub-sector sustainable in the long run. The study covered the major production cluster of mango, litchi, banana and pineapple in Bangladesh.

The findings of the study revealed that in the mango cluster, major flow of products is moving through the two main chains of Farmers-Pre-harvest Contractor-Rural assembler and purchasing agent-Rural Urban Wholesaler and Paiker-Retailer - Urban Consumer and Farmer-Rural Urban Wholesaler and Paiker-Retailer-Consumer.

The primary/direct actors in mango value chain in Satkhira, Chapai Nawabganj and Nagaon were input suppliers, farmers, traders and consumers. Each of these actors adds value in the process of changing product title. The main value adding activities performed by farmers prior to marketing is the postharvest handling activities such as grading and sorting, drying, cleaning, and standardizing. The primary aim of performing these activities is in order to deliver quality mango to the traders. They use materials such as basket, plastic bag, sack, cartoon and wooden box for packaging of mango during marketing.

The litchi value chain also starts from the input supply to the ultimate consumer engaging different actors such as input supplier, farmer, pre-harvest contractor, faria, bepari, aratdar, Processor, retailer and consumer. They act different roles in the value chain for adding value. The bulk of product flows follow the chain of Farmer- Aratdar-Retailer-Consumer. In addition, three more chains can be observed in the study areas. These are: i) Farmer-Bepari-

Aratdar-Retailer-Consumer; ii) Farmer-Faria-Aratdar-Retailer-Consumer; iii) Farmer-Aratdar-Retailer-Processor-Retailer-Consumer.

The banana value chain also starts from the input supply to the ultimate consumer engaging different actors such as input supplier, farmer, local trader (faria, bepari), distant trader (bepari, wholesaler), aratdar, small scale processing unit, retailer and consumer. They act different roles in the value chain for adding value. The bulk of product flows follow the chain of Farmer- Aratdar-Wholesaler-Retailer-Consumer. Banana producers are the main players in the value chain, who are mainly small to medium holder farmers with farm size ranging between 0.5 to 4 acres. The producers rarely use external inputs such as inorganic fertilizers, tissue culture seedlings and chemicals (at less than 1%) whereas approximately 18% use farm yard manure.

The bulk of pineapple flows the route of Producer-Bepari/Paiker-Wholesaler-Retailer (both rural and urban)-Consumer. The pineapple also flows i) Farmer-Retailer-Consumer; ii) Farmer-Bepari/Paiker-Wholesaler-Retailer-Consumer; iii) Farmer-Collector-Supermarket-Retailer; iv) Farmer-Wholesaler-Retailer-Consumer; v) Farmer-Wholesaler-Processor-Retailer-Consumer; vi) Farmer-Wholesaler-Processor-Exporter-International consumer. The main environmental issue of concern in pineapple value is the use of plant growth regulators for large size and ripening of the fruits which gradually reducing consumers trust on quality of pineapple from Madhupur and Ghatail. It is reported that 90-95% growers use plant growth regulators for the above purpose.

Before commercial production and marketing of some agricultural and food products like jam, jellies, marmalade, juice, sauces, squash, fruit cordial, concentrated fruit juice, and orchard by product like honey produced micro entrepreneurs (MEs) need mandatory registration and quality certification/standard mark from BSTI.

Findings on availability of non-revenue generating common services such as availability of security guards, good road communication facilities, market distance, market shed, electricity, water supply, Community latrine, demonstration on eco/natural farming, soil testing services, analytical services for pesticide residues & heavy metal, demonstration on technology transfer of bio/organic pesticide, Vermi-/Tricho compost/Solid waste etc have been presented and their role have been discussed.

For example market distance plays a critical role in productivity and profit of the fruit chains clusters. Findings revealed that 90% Ghatail farmers face difficulties to bring their produces into the market as their farms located more than 7 km away from the market. In the mango cluster Satkhira farmers (88%) are facing difficulties of market distance followed by Chapai Nawabganj (65%) and Nagaon (60%). In case of banana, in Bogura sub-cluster, farmers are in better position in terms of market distance compared to Narsingdi farmers. In of litchi farmers from Pabna sub-cluster are in disadvantage position compared to farmers from Dinajpur sub-clusters. Market shed is also important non-revenue generating common service activities that should be resolved by constructing market shed. In all fruit chains clusters, during the FGD and questionnaire surveys, 100% respondents reported that they are facing serious problem due to unavailability of market shed. During rainy season, they just use polyethylene/plastic shed for protecting and saving their fruits from rain and scorching sun shine which reduce the quality as well as quantity of fruits due to spoilage.

The findings revealed in the fruit value chain clusters, there is some revenue generating common service activities identified that will ensure higher revenue in the cluster. The services are establishment of farmer's market, establishment of cold storage, establishment of processing industry, Nurseries development, popularizing bagging technology, safe fruit production technologies and easy certification and establishment of local branding. The findings of the study revealed that 33% of the banana farmers have knowledge on eco farming while 18.75% pineapple farmers has the knowledge on eco farming and only a few (11 %) of the litchi farmers have knowledge on eco farming. Though the mango farmers have relatively poorer knowledge on eco farming and GAP, however a significant portion (23%t and 17%, respectively) of them have knowledge on branding and certification. Of the banana and mango farmers, 39 % and 35%, respectively have willingness to get certification for their products in future and 30% of them has willingness to pay for certification costs. On the contrary, only 16% of the litchi farmers are willing to get certification and only14% are ready to pay for the certification costs.

Considering other factors will remain constant, using time series data for the period of 2007-08 to 2016-17 on the area, production and yield of mango, litchi, banana and pineapple respectively, the growth rates are calculated by using linear growth model. From growth trend analysis, the estimated linear growth models for area, production and yield of mango, litchi, banana and pineapple, respectively and related statistical information revealed that in

case of mango sub-sector increase in area and yield is insignificant whereas production increases at 4.9%. Similar trend is also noticed in case of litchi. In case of banana there was negative trend in area (-1.9%) whereas there is positive trend of yield increase (0.93%). On the other hand there is positive trend of increase area of pineapple though the production and yield remain unchanged.

The findings on cluster wise area, production and technologies related to mango, litchi, banana and pineapple are reported and it was found along with Chapai Nawabganj, in the recent years mango is expanding in Satkhira and Nagaon districts. there is a significant difference in selecting the mango cultivation technologies such as varieties among the mango clusters . For examples Nagaon farmers have greater interest towards Amrapali, BARI-4 and Ashina. However, Fazli, Khirshapat and Langra are still preferred varieties in Chapai Nawabganj. It is also mentionable that due to climate change cracking and fruit dropping is increasing seriously in Chapai Nawabganj and Nagaon clusters. The rate of adoption "bagging in mango" is also getting popularity slowly in all clusters; bagging in mango is relatively better in Chapai Nawabganj cluster compared to other clusters. Unlike, bagging still use of PGR is also higher in Chapai Nawabganj compared to Nagaon and Satkhira. This is due to the reason that average age of mango trees in Chapai Nawabganj is more than 50 years and these are relatively less productive compared to younger mango trees. It is also reported that PGRs mainly 4CPA (Brand names- Chamak, Growth Plus, Tomtom, etc.), GA3 (Duranto, Baronto etc.) and Cultar are used in the mango production and ripening of fruits. Regarding marketing, it is observed that mango marketing is still problematic in Nagaon sub-cluster i.e Niamotpur Porsha and Sapahar. Among the different diseases, powdery mildew, anthracnose, stem end rot and gummosis & stem bleeding are the major diseases and farmers generally use fungicides such as Theovit 80 G, Agsul, Kumulus DF, Vitasul, Zineb, Maneb Dithane M-45, etc to control those disease. Mango farmers and traders also use hot water treatment to control stem end rot of mango fruit along with harvesting the fruits with long pedicel/stalk to avoid entry of fungus through the wounds at stem end during harvesting of the fruits.

Litchi comes to market in the months of May-June when the market is full of other fresh fruits, particularly mango and jackfruit. It reported by the key informants that the area under litchi cultivation is increasing in Iswardi, Pabna while it is steady in all sub-clusters of Dinajpur district. Due to climate change litchi is suffering fruit dropping. It is reported that the use of PGR for fruit setting is common in both clusters and sub-clusters. Rather, farmers

in all areas they are spraying **"chelated Zn"** that helps in getting better growth and color of the fruits. It is very interesting that the litchi farmers of Iswardi upazila are **"using salt in the litchi plant for getting higher yield and rapid growth of the fruits".** However, in the recent years they are not using PGRs for ripening of the litchi fruits. It is also reported that among the all sub-clusters **"honey is producing additionally with litchi"** in Chirirbandar and Iswardi. Honey production in litchi orchard is giving additional income as well as assisting in better fruit setting in the orchards. Litchi marketing has not any problems in any sub-clusters except Birgonj. However, due to harvesting in the month of Ramadan litchi farmers did not get proper for the last couple of years.

It is reported that the trend of banana production is increasing in Narsingdi while it was found a bit declining in Bogura. This is due to the reason of severe infestation of diseases like Panama and Sigatoka in Bogura for the last several years. It is surprising that the farmers of Bogura are cultivating potato, chilli, cabbage and cauliflower as intermediate crops which are not really practiced in Narsingdi cluster. However, it is found positive that **"bagging"** is getting popularity both in Bogura and Narsingdi. It is also reported that in case of the variety "Shobri' bagging is required relatively higher time for getting maturity of the banana. However, in case of the variety Sagor and Meher Sagor bagging does not have such kind of complain. In both clusters majority of the key informants have given emphasis on **"disease free tissue culture sucker"**. Both clusters have demand for processing industry for sustainable growth of banana production in their areas. However, in case of Narsingdi they demand for declaring their *Deshi Sagor kola* as GI crop.

Pineapple is one of the most important commercial fruit crops in Bangladesh. The trend of pineapple production is still increasing in Madhupur cluster while it is a bit sluggish in Ghatail compared to several years back. This is due to the poor market price compared to other competitive crops like banana. However, due to having highly suitable soil for pineapple production, areas under pineapple cultivation and total production of pineapple is increasing continually in Madhupur cluster. It is amazing that the farmers of Madhupur and Ghatail clusters are cultivating papaya, banana and sweet potato as intermediate crops with pineapple. It is found that the chemicals (PGR and ripen) using behavior of the farmers of two clusters are quite opposite. Farmers of Madhupur area use relatively higher doses and higher frequencies of PGR in growing pineapple while it was significantly lower in Ghatail cluster. It is also reported that ripen, Tom-tom, Denofix, Superfix and chemicals of about 100 different types have flooded the pineapple fields of Madhupur. There is a bit marketing problems of pineapple in Ghatail, which is very structured in Madhupur. However, there is a good

demand in both clusters for pineapple processing industries that may add value in pineapple sector of Bangladesh.

Due to increasing attack of insects and diseases and climate change like drought, high temperature, in commercial fruit cultivation is creating higher dependency on different agro-chemicals like pesticides and PGRs. The application of pesticide becomes an unbeatable part to fruit crop cultivation in Bangladesh. Also brick kilns are serious threats to the production of mango and litchi through reduction of yield and ripening of immature fruits due to release of ethylene and acetylene gases through using coal for burning of bricks in the brick kiln. Also use of coal in the brick kiln releases sulfur dioxide gas which is harmful for growth and development of crop plants and may result in acid rain. Uses of cultar in the mango and litchi orchard for having regular crop result in untimely death of the established trees.

About one-third (32%) of the mango farmers have the perception that the huge amount of agrochemicals used in commercial mango cultivation is degrading the soil, water and environmental health. Next to mango, a significant portion (22%) of the litchi farmers also has similar perception. While, highest majority (94 %) of the banana farmers have the perception that the amount of pesticides they are using in banana cultivation is not hampering the environment. The majority (89%) of the pineapple growers also have the similar perception regarding agro-chemicals use.

Farmers in all clusters of the selected fruits have been suffering from the consequences of climate change and the major consequences are like irregular pattern of rainfall, prolonged drought and sudden floods. However, it is also reported that among the selected fruits litchi and mango production has been reduced significantly in the recent years especially due to prolonged drought followed by irregular rainfall. Moreover, incidence of insects and diseases has also been increased in the recent years due to consequences of climate change. Litchi farmers from both Dinajpur and Iswardi clusters also reported that due to sudden cyclone the rate of devastation in litchi orchard was enormous in the last couple of years.

It is reported that the existing policy environment is quite poorer for the selected fruits. The majority of the farmers have the perception that they have relatively poorer access to all policy indices. Less than half (45%) of the mango growers has access to extension services while it was least in case of pineapple growers. However, in case of access to IPM and bio products all types of fruit growers has relatively poor access. However, more than half of the mango growers have access to market and scope of adding values like preparation of jam,

jelly, pickle etc. which has found least among the litchi growers. However, all categories of fruit growers have the perception that they have little access to processing industries as well as poorer scope of getting certification and premium prices.

For operating any value chain good quality human resources or labor forces is necessary. As commercial fruit cultivation requires special skill, thus it is a bit burning issue for managing labor forces or quality human resources for the selected fruit value chain. Moreover, due to higher extent of rural-urban migration and shifting agricultural labor into industries led to labor scarcity in some areas. Average numbers of labor required per acre per year for mango, litchi, banana and pineapple are 75, 50, 50 and 60 respectively. The average labor cost per acre mango orchard is 30000 Tk. It is also reported that there is moderate scarcity of labor in all mango clusters. However, labor scarcity is higher in Chapai Nawabganj and relatively low in Nagaon cluster. Pineapple found as second higher labor intensive value chain which require about Tk. 27,000 per acre in a year. However, it is mentionable that per day per person labor wage found highest in Madhupur pineapple cluster like Narsingdi banana cluster. Unlike, all mango clusters, labor is moderately scarce in both pineapple clusters.

Finance is very important for production of any commodity. The major source of finance for production of Mango, litchi, banana and pineapple is banks (53.3%) followed by NGOs (20%), own fund (13.3%), cooperatives (6.7%), and supplier of trade credit bank (6.7%). The cost analysis indicates that benefit cost ratio for mango, litchi, banana and pineapple were 1.29, 1.70, 1.39 and 1.34, respectively showing that cultivation of these is profitable ventures.

Associations of fruit producers and traders have the potential to both facilitate the work of their members and to achieve greater efficiency in the production and marketing chain. In the present study both producers' and traders' associations were found in case of mango, banana and pineapple; but no association was found in case of litchi. In case of mango both growers and traders associations are functional and providing information on cultivation technologies, market information, awareness building campaign against early harvesting of immature fruits, use of PGR for fruit ripening, use of culter for regular crop etc along with welfare activities of their association members. In case of banana all the growers associations were found functional. In case of pineapple cluster, both growers and traders associations are in existence. But only the traders associations are found to be functional.

The MEs view obtained from the FGDs have been scored and analyzed using Likert scale (0-4) and results on strength and opportunities of fruit (mango, litchi, banana, pineapple) sub-sector of Bangladesh. The major strength of the fruit clusters are once planted, long term fruit production (3-4 years in of banana and pineapple, at 40-50 years in case of mango and litchi); less labor required , less irrigation required, high yield, more income from intercrops, more profitable than rice or other crops and fulfilling national nutritional demand The areas of opportunities are earning foreign exchange following GAP/Eco-labeling, having organic certification possibility to get premium market price, more employment and income by setting processing industry, possibility to reduce import of processed fruits & export processed fruit products, possibility to value addition through branding, possibility to solve production and marketing problems through farmers' cooperatives, possibility to reduce long term climate change through increasing green belt .

The MEs views regarding constraints/challenges of the fruit sub-sector under study obtained through FGDs have been scored and analyzed using Likert scale (0-4). The score varied among the issues discussed for different fruits. For example, in case of mango entrepreneurs, among the seven issues raised, they are highly agreed with the issues of authorized and unauthorized fruit import, negative impact of climate change, vulnerability to diseases and insect pest due to mono cropping, as perennials, difficult to discontinue the enterprise when becomes non-profitable, uncontrolled marketing system as constraints/threats and moderately agree with uncontrolled production and low very agreement impact on national food security due to competition of land. Two constraints/threats viz more vulnerable to diseases and insect pests due to mono cropping as perennials, and difficult to discontinue the enterprise when becomes non-profitable scored the same (3=Highly agree) for mango, litchi and banana. Overall, mango and litchi being long duration perennials; ME farmers are more vulnerable to the constraints/threats compared to banana and pineapple farmers as those short duration perennial (semi-perennials) crops.

It is very important to assess the sustainability status of the production and marketing system of a crop or commodity in the long run. In this regard each of the fruit crop for the present study was assessed on the basis of four dimensions like technological, economic, social and environmental issues.

It is evident that mango value chain is found highly sustainable compared to other value chains. However, among the three clusters of mango Chapai Nawabganj is far ahead in terms

of all sustainability dimensions. While, Satkhira is relatively far behind, compared to Chapai Nawabganj and Nagaon mango clusters.

However, in terms of economic aspects litchi is found very sustainable compared to banana and pineapple. While, all the selected value chains were found relatively less sustainable in terms of social and environmental aspects. Though litchi was found economically sustainable, in between two litchi clusters Dinajpur was found relatively better. While in between two banana clusters Narsingdi was found better compared to Bogura. On the other hand, Madhupur pineapple cluster was found more sustainable compared to Ghatail pineapple cluster from all perspective of sustainability.

Recommendations

Based on the findings of the present study and consultants' experiences, the following recommendations are formulated for consideration by the authority of the Sustainable Enterprise Project of PKSF for implementation for sustainability of the fruit (Mango, litchi, banana and pineapple) sub-sector in Bangladesh:

1. Revenue generating common activities such as i) establishment of farmers' market, ii) construction of cold storage for storage of fruits, iii) establishment of small scale processing industry at household level, iv) establishment of modern nurseries for QPM & tissue cultured planting materials of banana and pineapple, v) promotion of fruit bagging technologies, v) promotion of safe fruit production technologies for fruit production such bio-pesticides, bio-hormones, bio/organic fertilizers, vii) easy certification and establishment of local branding should be carried out by both public and private sector for sustainability of the fruit sub-sector in the long run. Some of those activities can be done by the public sector under public private partnership (PPP) where public sector will provide the land and private sector will bear construction cost or may be vice-versa and revenue earned can be shared.

2. Non-revenue generating common service activities such as i) availability of security guards, ii) good road communication facilities, iii) market shed, iii) supply of electricity at the market places, iv) water supply at the market, v) community latrine at the market, vi) demonstration on eco/natural farming, v) soil testing services, vi) analytical services for pesticide residues & heavy metal and vii) demonstration on technology transfer of bio/organic pesticide and Vermi-/tricho compost/Solid waste

etc should be ensured at field level by the government, businessmen associations, farmers group and market communities for sustainability of the fruit sub-sector in the long run.

3. The marketing system should be straightened avoiding so many intermediaries in the value chain using ICT such as mobile phone, internet, Facebook as practiced by some of the mango growers and traders from Chapai Nawabganj as reported during KIIs and FGDs.
4. Quality & safe producers of mango, litchi, banana and pineapple should be linked with the premium markets such AGORA, PRAN, SWAPNO and exporters for better price and to earn foreign exchange.
5. Development of climate resilient varieties and mitigating technologies through research and promotion of their uses at field extension service providers should be ensured.
6. Development and extension of high yielding varieties with better nutrition, improved cultivation technologies and better post-harvest and processing quality of mango, litchi, banana and pineapple should be strengthened both at public and private sectors. In this regard, internationally recognized MD 2 variety of pineapple, a premium and high yielding variety of pineapple and high yielding banana variety like Grand Naine (G9) and mango varieties like Irwin and Keit may be considered for introduction and commercial cultivation in Bangladesh for local consumption and export abroad following standard procedure of Plant Variety Introduction. (Requirements and procedure of getting Phytosanitary certificate from Plant Quarantine Wing of DAE has been provided in Appendix-VI).
7. Production of processed products such jam, jelly, bar, squashes etc. should be promoted at MEs' level and marketing can be done at local level branding as home-made processed products provided proper health, sanitation, quality and standard are properly maintained by the entrepreneurs. Methods of small scale production of processed products from mango, litchi, banana and pineapple at household level have been provided in Appendix-VII.
8. Registration of processed products for marketing should be simplified and less time consuming as far as possible.
9. Mango, litchi, banana and pineapple are long duration fruit crops and need relatively long time to get the return; therefore, long term soft loan i.e interest at bank rate may be given to the MEs involved in this sector.

10. MEs involved in production of safe and quality fruits and processed foods of mango, litchi, banana & pineapple and input suppliers involved in supplying of environmentally inputs such as organic fertilizers, organic/pesticides/ bio-hormones, fruits bags, environmentally friendly packaging and processing materials may be provided with soft loan to encourage them to stay in the business.
11. Illegal practices such as harvesting of fruits before maturity, excessive or unlawful use of inputs such fertilizers, toxic substances, pesticides; hormones at field level, after harvest and during processing should be strictly prohibited. Awareness building campaign against those issues should be carried out at growers, traders, processors and consumers' level using mass media such as radio, TV, mobile phone, internet, stakeholders' meeting etc.
12. Training of the MEs in different aspects of production, marketing, quality, safety and standard of fresh fruits and food products of mango, litchi, banana and pineapple is needed for sustainability of sub-sector in the long run.
13. Efforts should be taken for keeping the MEs associations functional and vibrant to implement government policy in the fruit sector along with implementation of many activities such as non-revenue generating physical activities, revenue generating activities, dissemination of cultivation technologies, market information, awareness building campaign against illegal practices, at different levels of the value chain.