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The Biomass-based Value Web as a Novel Perspective on the Increasingly Complex African Agro-food Sector

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Introduction

The increasing global demand for biomass as primary agricultural products and feedstock for various forms of usage, transforms agriculture from a food to a biomass-supplying and processing sector in which the utilization of the various feedstock and intermediate products is more flexible than it was in the past decades. Besides the demand increase for food and feed, the accelerated demand for biomass-based energy has started to change the global agricultural production and price structure. However, on bioenergy's coat-tails, biomass demand for other uses has increased as well (i.e., fiber and other industrial raw materials, pharmaceuticals, cosmetics, flowers and other ornamental demand as well as the environmental functions): Substituting biomass-based products for crude oil-based products in various industrial areas is – if not yet in mass-production – in its experimental phase. For instance, the market for biomass-based plastic grows: The Coca-Cola company is already using 30% biomass-based PET plastic (Ritschkoff, 2014), while Toyota and other car brands have started to replace oil-based plastic for cars with bioplastics (EBB 2013, TTC 2013). This rise in global biomass demand is an opportunity for many agricultural-based, low-income countries to diversify their economy. Yet, concerns prevail that producing more and diversified non-food crop biomass commodities will compete with domestic food production and perpetuate these countries' status as mere suppliers of raw materials. Three strategies may counter these concerns:

1. The involved countries have to ascertain the priority of ensuring or improving the status of food security at national, regional and local level while taking advantage of emerging bioeconomies worldwide. To achieve this, the focus should be on job-creating crop production and processing. Another approach is the certification of the production of all types of biomass (food, feed, fuel, fiber, etc.), whether exported or nationally used, for not being in conflict with food and nutrition security; best in combination with a global monitoring of the impact of non-food biomass use on food security.
2. The agrarian dominated economies with high biomass production potential will benefit significantly more from the increasing demand for biomass if major parts of the value addition to the raw product "biomass" will take place in a domestic labor-intensive processing sector.
3. To prevent excessive pressure on natural resources, a productivity increase has to be part of the emerging bioeconomy, partly through sustainable production intensification, but also through efficiency gains in the post-harvest, processing and trading activities.

The concept of bioeconomy needs a biomass-based value web approach

The complexity of value chains of agricultural products is increasing significantly. With the evolving bioeconomy, especially the demand side for different biomass types will be branching out with impacts at the handling, processing and trading level leading to an augmented diversity of activities. Part of this development is that especially at the processing and trading level, the recycling and cascading effects to utilize and reutilize biomass at a very high degree ("zero waste") will lead to merged value chains. Hence, it is no longer sufficient to analyze the system by following the conventional more (isolated and) linear, mainly product-focused value chain approach. Analytical perspectives are needed which cover the complex pathways of biomass which include but go beyond the concept of value chain analysis. Here the holistic concept of biomass-based value webs becomes instrumental.

A biomass-based value web approach utilizes the 'web perspective' as a multi-dimensional framework to understand the interrelation and linkages between several value chains and how they are governed. Instead of depicting the pathway of one product and thus being in tendency more industrial oriented, the web approach captures the manifold products which are and can be derived from one biomass raw product respectively. It looks at the whole product mix produced on family farms, the different value chains the households participate in and how they are and could be linked. The web perspective helps to explore synergies between these value chains, to identify inefficiencies and to pinpoint potential for productivity increases in the entire biomass-based value web of a defined local, national or international system. This includes the analysis of existing and potential recycling processes and cascading uses during the processing phase of biomass – often neglected in value chain analyses – which opens new opportunities to locally capture more of the value-added. The cascades of use and interlinking of value chains is instrumental to increase the efficiency of resources and the sector, reduce possible areas of competition between uses and to make use of innovation potential (BMEL 2014, BMBF 2011).

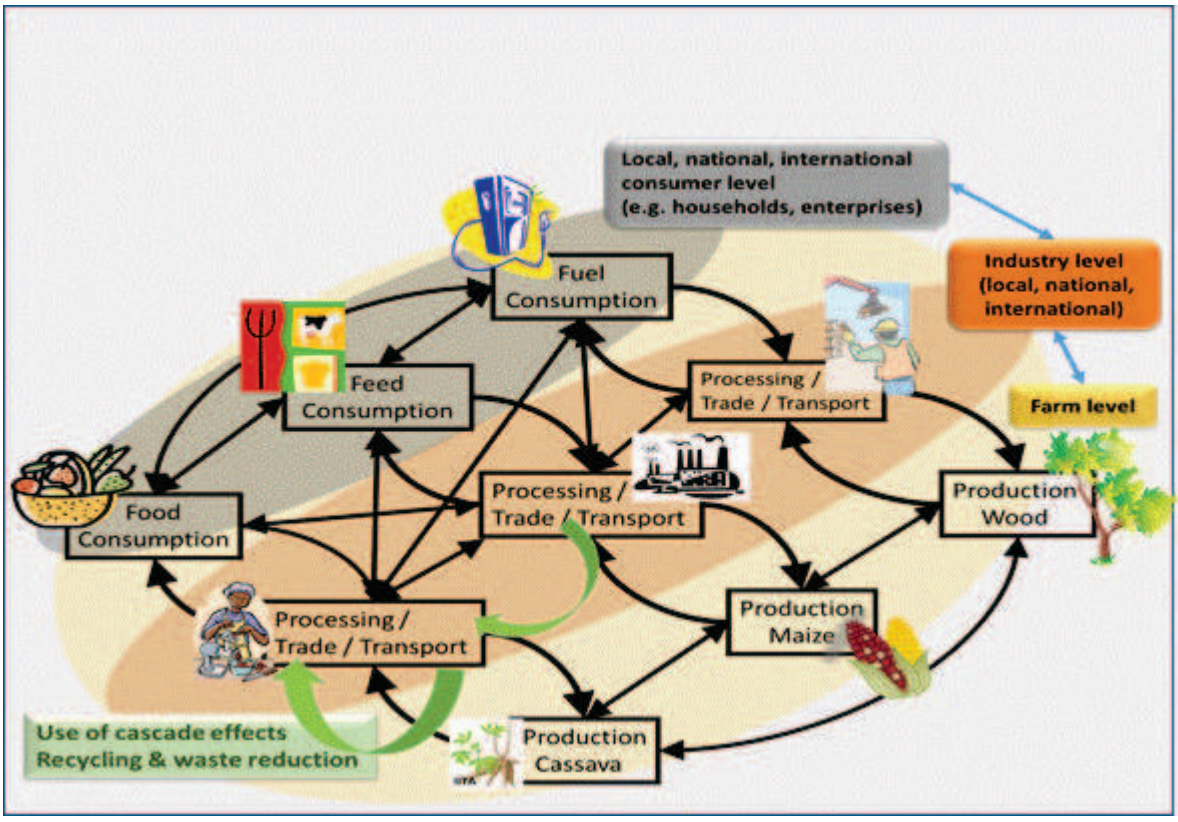

Figure 1: Simplified biomass-based value web

Source: Virchow et al. 2014

The web perspective also assists to better identify who participates and benefits across the different value chains (e.g. men or women, small or large producers/processors, national or international actors) and who not, in which activities and processes, whether and how the actors cooperate and network with each other. This helps to identify missing links and needed actors, information gaps, capacity constraints as well as governance structures and power relations. The analytical approach can also be used to assess profit and other benefit distributions among the different actors and female/male participants in the whole web. Thus, opportunities can be detected how and where more value could be captured in poor producing countries, how it could be more equitable distributed and where access to food through job and income generation can be increased (Kaplinsky 2000; Bolwig et al. 2010).

First experiences from Ethiopia and Ghana

The value chains of maize, cassava, plantain, enset and bamboo have been analyzed in Ethiopia and Ghana in close collaboration with stakeholders representing farmers' associations, the Ministry of Food and Agriculture, the commodity exchange, food research institutes, food marketing institutions, a food policy program, a seed enterprise, the bamboo sector and university institutes. The five crops are used for both, food and non-food purposes. The participatory modeling approach with the stakeholders indicated that in both countries the value chains of the analyzed crops do not show relevant links to each other and thus, the basic structure of a value web is not yet in place. An obvious entry point to link value chains and increase efficiency is seen by the experts in transportation and storage, which would be the start of a web structure. Further entry points might be the wholesalers and retailers (supermarkets have not been considered). The joint downstream processing of intermediate products might be a future option.

Outlook

Increasing the activities of the domestic processing industry for biomass products will need the political commitment of governments as well as international support. Technical infrastructure, a skilled labor force, and financial instruments are part of the solution. Important are also further research and investments in labor-intensive yet capital-saving processing technologies for biomass commodities in low-income and biomass-rich countries. In the long-term, a sustainable domestic processing of biomass and value addition will also require that a domestic demand and thus market develops.

The emerging bioeconomies may help low-income countries with high biomass production potential to generate jobs and income in the biomass producing, processing and trading sector in rural and urban areas. Key challenges are to identify ways in which poor countries and poor producers can take advantage of these opportunities; which types of biomass, processing and technologies offer a chance for producers and processors and how, at the same time, food security can be enhanced and poverty reduced. Further knowledge gaps exist where the respective value chains and value webs need adjustments and support to ensure that value addition not only stays in the producing countries but also contributes to improve the livelihoods of family farmers, to foster small and medium sized processors and generate employment opportunities.

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