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DEUTSCHE ZUSAMMENARBEIT

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Energy efficient heating devices and use of alternative biomass fuel in rural households of Armenia

Plan of promotion



Working Document
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Background information

Different surveys and statistics from recent years show that fuelwood has been largely used as a heating fuel especially in rural areas. According to the various assessments (2014-2018) the annual demand for fuelwood in Armenia varies from 0.5 to 2 mln m³. This significantly exceeded the reported fuelwood supply and forest renewal capacity in Armenia resulting in forest degradation and deforestation. So far, animal dung is a common alternative for fuelwood. However, being used for heating, animal dung will no longer be available as valuable organic fertilizer.

The Baseline Study on Energy Demand, Supply and Efficiency in Rural Armenia was conducted in 2019 in the frames of the “Management of natural resources and safeguarding of ecosystem services for sustainable rural development in the South Caucasus” program (ECOserve) implemented by GIZ jointly with the partner Ministry of Territorial Administration and Infrastructures (MoTAI), Ministry of Environment (MoEnv) and Ministry of Economy (MoEc). It analyzes the heating energy issues in rural HHs which use fuelwood or dung as the main fuel and proposes sets of recommendations for reduction of the demand of fuelwood/dung. The main technical solutions include thermal insulation, replacement of inefficient heating devices, the shift to alternative solid biomass fuel and others. The study summarizes also the problems and inconveniences caused by the current heating practices to households (HH) and especially women such as the difficulties in getting and preparing fuelwood, high workload and time consumption linked to the heat and stove maintenance, indoor air pollution, uncomfortable (insufficient, partial) heating, safety issues and others.

In the beginning of 2020, the feasibility study on marketable approaches to reduce the use of fuelwood and dung for heating in rural communities of Armenia was conducted. The study covered the main measures on renewable energy (RE) and energy efficiency (EE) for rural HHs in Armenia in relation to the heating. The main analyzed measures include thermal insulation, the use of solar and geothermal energy as well as heating devices (stoves and boilers), the use of alternative solid biomass fuel (straw briquettes) and others. A cost-benefit analysis (CBA) was done to define the financial/economic feasibility and sustainability of the approaches/products and their potential for scaling up. The conclusions from the feasibility study and CBA were then used to develop feasible pilot interventions.

The target group for the feasibility study and the pilot intervention is the rural population in Armenia. To ensure the feasibility of the intervention, the readiness of the respective HHs to make upfront investment or accept certain years for the payback period has to be considered. In general, it can be assumed that people in rural areas have problems to make (big) upfront investments and are not eager or able to take loans due to already existing financial commitments or obligations. Therefore, to conclude on economic feasibility and consequently the marketability/replicability of the analyzed EE and RE measures, the ones requiring lower investment cost and higher internal rate of return were considered as the most feasible for the pilot interventions.

The results of the feasibility study and CBA showed that for forest adjacent areas the replacement of existing inefficient heating devices (stoves and boilers) with efficient devices are economically most feasible measures for rural HHs which ensure the highest monetary savings. The results of the CBA for forest distant areas showed that the replacement of existing inefficient heating devices (stoves and boilers) with efficient devices in conjunction with the shift from fuelwood to straw briquettes as alternative fuel are the most feasible measures which ensure the highest fuelwood and monetary savings.

Based on these insights a pilot intervention targeted at rural HHs was designed with the aims to promote the locally manufactured energy efficient stoves and use of straw briquettes. More specifically, the pilot intervention covers the piloting of more efficient locally manufactured stoves suitable for fuelwood and straw briquettes; the improvement of the value chain for use of straw briquettes based on the existing briquetting facilities, and the improvement of indoor air conditions and benefits to women. It is in the process of implementation in a number of target community clusters in Shirak, Lori and Kotayk regions.

Meanwhile, the promotion of energy efficient devices and shift from fuelwood/dung to alternative

biofuel at HH level all over Armenia is a key measure to reduce the use of fuelwood/dung and forest degradation. During recent years a range of initiatives and projects have been implemented with targeted actions in various regions. This included the provision of both locally produced and imported EE stoves to HHs, the establishment of briquetting/pelleting facilities with donor support and private investment and others. At present the Government of Armenia has initiated the steps to identify the opportunities for the solid biofuel market development in Armenia. The respective study with analysis is ongoing to suggest strategic approaches and actions.

In this context, the collaborative and coordinated activities at different levels by the state, international cooperation, scientific-research organizations, financial institutions, NGOs and others are important to promote and upscale the approaches of energy efficient devices and shift to alternative biofuel at HH level.

EE heating devices and use of alternative biofuel in rural HHs: main problems and solutions

The rural houses are privately owned by HHs, therefore the public focus and support to the issue of HH heating energy and its inefficiency has been limited. There was some focus on non-gasified communities to support subsidized lending and installation of solar energy systems as an alternative energy source in these communities. The rural HHs can also use the net metering provision for rooftop solar photovoltaic (PV) systems. However, the use of electricity for heating is not common in rural HHs. In general, the issue of rural HHs and their heating energy use so far has not been sufficiently reflected in respective national plans and programs or targeted by the state institutions.

The recent studies showed that over 70% of rural HHs routinely use fuelwood as one of their heating fuel sources. In addition, they often use inefficient heating and hot water preparation devices. The used combustion technologies negatively influence the indoor air quality and health, increase the workload for fuel preparation and maintenance of heating, etc. Often this relates to women, who spend more time at home and may have additional inconveniences. The rural HHs use locally produced self-manufactured single point inefficient stoves or biomass boilers. During the recent years, there has been a rising trend towards installation of centralized heating systems with radiators and locally produced biomass (fuelwood) boilers. Apparently, shifting to the centralized heating with biomass increases the fuelwood demand unless the alternative fuel is available. At the same time, in communities with abundant straw resource base there is growing interest in production and use of straw briquettes.

Efficient biomass stoves (and boilers) in combination with use of alternative biomass straw briquettes can be considered as priority measures to reduce the use of fuelwood/dung in rural HHs. The main barriers to the wider spread of those measures include:

1. Availability and affordability of the efficient biomass stoves (and boilers) working with biomass including wood and straw briquettes.
2. The need for best suitable adapted technologies for utilization of straw in the communities with high straw resource base.
3. Availability and affordability of alternative biomass (straw) fuel to rural HHs.
4. Insufficient awareness and information about the advantages of efficient devices and alternative biofuel at HH and community level as well as available financing opportunities.
5. Limited financial resources for replacement of inefficient devices and for the use of alternative biofuel.

New financial mechanisms should be considered for establishment of briquetting facilities in the areas with sufficient straw resource base. The financing sources can include governmental subvention programs and community budget, financial leasing of equipment, loans with governmental subsidies, in-kind and financial contribution of community and individual HHs, support projects and others. The most relevant business models and technologies should be additionally studied and identified as the most functional for the given preconditions in Armenia.

Action plan to promote EE devices and alternative biomass fuel

This plan of promotion is aimed at the rolling-out and upscaling the EE devices and using alternative biomass fuel at HH level for more efficient use or substitution of fuelwood/dung, which implies also benefits to women. The plan mainly refers to the single-point stoves for solid biomass fuel but can also be valid for the boilers working on such fuel. The alternative solid biomass fuel includes briquettes produced mainly from straw but can include also other “green” biomass residuals from fruit orchards, vineyards, agriculture, etc.

This promotional plan summarizes the activities in the fields of enabling frameworks, cooperation, capacity-building, financing, awareness raising, value chains and others. The timeframes for the activities are mentioned indicatively: short-term - approximately 6 months, and mid-term – approximately up to 2 years.

The implementation of this plan will require the actual involvement of various stakeholders, including government agencies, local self-governing bodies (LSGB), non-governmental organizations (NGO) and other local active players, donor programs and international organizations, research and financial institutions. Extended and effective cooperation should be ensured, as well as regular exchange of information and cooperation, taking into account previous successful experience and lessons learned. The inclusion of relevant actions in the state strategic program documents, as well as the coordination of their implementation through various ongoing or planned programs and initiatives can greatly contribute to the promotion of EE stoves, briquettes, as well as other EE/RE measures at the HH level in rural communities.

	Activities	Timeframe	Main responsible state authority	Expected result	Implementation opportunities: processes, structures and possible sources of funding
1. Improving Policies and Standards, Enabling Framework					
1.1	Development of standards and procedures for solid biomass briquette stoves	Short- to mid-term	National Body for Standards and Metrology, MoEc, MoEnv	Standard and/or technical terms on solid biomass briquette stoves	Current processes of development of sectoral strategies, state and international cooperation programs
1.2	Development of standards and procedures for solid biomass fuel (briquettes, pellets)	Short- to mid-term	National Body for Standards and Metrology, MoEc, MoEnv	Standard and/or technical terms on solid biomass fuel	
1.3	Quality (standards) assurance and quality control of produced stoves and biomass briquettes	Short- to mid-term	MoEc, National Body for Standards and Metrology, state supervision bodies	Energy efficient stoves and reduction of the amount of used biofuel (fuelwood, etc.)	
1.4	Elaboration of the solid biofuel market (straw briquette market) development policy with introduction of legal, economic and fiscal mechanisms for development of the solid biofuel market and increasing availability and accessibility of (straw) briquettes at HH level (UNDP supports to development of a road-map)	Short- to mid-term	MoEnv, MoTAI, MoEc	Use of alternative biofuel, reduction of the fuelwood use	
1.5	Reflecting the issue of rural HH heating energy and efficiency issues in respective sectoral strategies and plans, recognizing the importance of EE and alternative biofuel in the sectoral policies in particular of the energy, forest and agricultural sectors	Short- to mid-term	MoEnv, MoTAI, MoEc	Reduction of the fuelwood use	

2. Cooperation and coordination					
2.1	Intersectoral cooperation as well as exchange and dialogue between the state authorized bodies and other players	Short-term	MoEnv, MoTAI, MoEc	Coordinated and coherent actions for EE and RE measures in particular EE stoves and alternative solid biomass fuel	Inter-ministerial (cross-sectoral) processes, programs implemented by international cooperation organizations (GIZ, UNDP, GEF/SGP, FAO, KfW, etc.), LSGBs, NGOs, private companies, financial, research and educational institutions
2.2	Seeking partnership between organizations with mutual interests and goals in implementing (demonstration) projects on EE stoves and alternative solid biomass fuel and scaling-up nation-wide	Short- and mid-term	MoEnv, MoTAI	Wider use of EE Stoves and alternative biofuel	
2.4	Directing the ongoing and upcoming financial (donor support) programs for disseminating EE stoves and alternative biofuel at HH level (along with the other EE and RE measures)	Short- and mid-term	MoEnv, MoTAI	Wider use of EE Stoves and alternative biofuel	
3. Capacity-building					
3.1	Creating capacities (laboratories) for the stove and alternative solid biomass fuel quality testing and certification, including development of methodologies, procedures, equipment, etc.	Mid-term	National Body for Standards and Metrology, MoEc, MoEnv	Presence of certified laboratories, promoting efficient stoves and alternative biomass fuel markets	State programs and programs implemented by the international cooperation (GEF, UNDP, GEF/SGP, FAO, KfW, etc.), research and academic institutions, NGOs, private structures etc.
3.2	Testing the efficiency of locally manufactured HH stoves with potentially high performance	Short- and mid-term	National Body for Standards and Metrology, MoEc	Promoting efficient stoves and alternative biomass fuel markets	
3.3	Improving and customizing the design and performance of EE stoves, publishing manufacturing instructions for the most efficient models including	Short- and mid-term	MoEc, MoTAI	High efficient stoves	

	working drawings and user manuals				
3.4	Supporting the commercialization and marketing of local producers of EE stoves, f.e. via technical support to register the most efficient models of HH stoves, etc.	Short- and mid-term	MoEc, MoTAI	Promoting efficient stoves market	
3.5	Exchange of information, knowledge and experience between manufacturers from different regions	Short- and mid-term	MoEc, MoTAI	Promoting efficient stoves market	
3.6	Capacity-building for potential producers of straw briquettes with technical support including the info on the most suitable equipment for briquette production, availability of straw resources in different regions of Armenia, etc.	Short- and mid-term	MoEnv, MoTAI	Promoting straw briquettes market	
3.7	Primary and secondary vocational education and training for professional workers to manufacture high-efficient heating devices	Mid-term	Ministry of Culture, Education, Science, Sport, MoTAI	Promoting efficient stoves market	
3.8	Establishing opportunities in local structures (LSGBs, NGOs, local activists, initiatives, media, women-led organizations, straw briquette makers, etc.) to promote EE stoves and alternative biomass fuel and other EE/RE activities	Short- and mid-term	MoTAI MoEnv, MoEc	Wider use of efficient stoves and alternative biomass fuel	
4. Awareness raising and information					
4.1	Dissemination of appropriate information to rural HHs (information materials and campaigns, “Energy Bus”, on-line learning platforms, community of practice, discussions,	Short- and mid-term	MoEnv, MoTAI, MoEc, Ministry of Culture, Education, Science, Sport	Wider use of efficient stoves and alternative biomass fuel	State programs and programs implemented by international cooperation organizations (GEF, UNDP, GEF/SGP, FAO,

	etc.)				KfW, etc.), regional administration and LSGBs, NGOs, educational institutions, regional Aarhus Centers, etc.
4.2	Establishment of information centers of EE measures, info on service vendors and suppliers, access to finance and grants and rural HHs with decision making including women (“Help Center” or “Energy hot line” for free expert consultations)	Short- and mid-term	MoEnv, MoTAI, MoEc, Ministry of Culture, Education, Science, Sport	Wider use of efficient stoves and alternative biomass fuel	
4.3	Demonstration projects - dissemination of EE stoves with advantageous conditions and incentives for shifting to straw briquettes (applies also to other EE/RE measures at HH level)	Short- and mid-term	MoEnv, MoTAI, MoEc, Ministry of Culture, Education, Science, Sport	Wider use of efficient stoves and alternative biomass fuel	
5. Financial issues					
5.1	<p>To study and implement the following financial mechanisms where possible:</p> <ul style="list-style-type: none"> • Subsidized, grant, interest-free or other soft loan schemes and social assistance programs to shift to efficient heating systems (also for other EE/RE measures at HH level), also aimed at the low-income and female-led HHs. • VAT and other tax exemption for imported EE devices and briquetting equipment and production of EE devices and alternative solid biomass fuel • “Green” public procurement practices for alternative biomass fuels • Financial incentives by banks and 	Mid-term	MoTAI, MoEnv, MoEc, Ministry of Finance	Wider use of efficient stoves and alternative biomass fuel	State, financial institutions (local and international such as EBRD, ADB, etc.), community revolving funds, etc.

	<p>credit organizations with adding certified stoves to the list of eligible EE equipment for credits</p> <ul style="list-style-type: none">• Promote various financial mechanisms (state subvention programs, community revolving funds and other innovative mechanisms) for establishment of community-level briquette production facilities in the communities (or community clusters) with abundant straw resources and developing respective technical capacities in the communities				
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