Annex 3: Economic and Financial Analysis

Contents

I. Introduction

1. The development objective of Community-based Agriculture Support Programme 'plus' – (CASP+) is to increase resilience of ecosystems and adaptation of livelihoods in rural areas affected by climate change in Tajikistan. It is expected that this will be done by establishing a transformative policy and investment framework leading to climate change resilient livelihood patterns for vulnerable households and to carbon sequestration potential in the country. The core intervention area of the project will comprise the 21 districts: 16 in Khatlon region, 3 in RRS region and 2 in the Sughd region, which are selected as the most vulnerable to the combined effects of direct and indirect impacts of climate change. The selection of districts has also considered: (i) overlaying with watershed/river basin boundaries; (ii) adjacency of selected districts to facilitate implementation; (iii) equal representation of the three agro-ecologic zones for inclusion of upstream and downstream communities highly affected by climate change.

2. To define the potential of livelihoods diversification and enhanced agrifood value chain activities, a sub-criteria in the form of presence and proximity to peri-urban and urban areas, relevant to ensure market access for smallholder producers is also applied.

3. The project will intervene in key hot spots of target areas with investments aimed to (i) improved pasture management; (ii) climate-resilient infrastructure; (iii) agriculture equipment/machinery; (iv) improved forestry management; (v) livelihoods diversification activities and (vi) support of Productive Alliances. These investments will not only fill immediate needs of the populations in terms of climate change, but will also build sustainable patterns to influence public interventions as well as private sector's decisions under the climate resilience angle using ecosystem-based sustainable NRM approaches through implementation of such planning tools as Climate-sensitive Community Action Plans (CsCAPs) and detailed business plans.

4. While the project will focus on the selected target areas, the interventions and the knowledge generated through the evidence-based approach will allow the country to scale-up the approach to additional priority districts and will have a parallel country-wide and demand-driven outreach, in order to stimulate the economic incentives and ensure long term impact beyond the project's investment.

5. **The total outreach** will include will include 650,000 **direct beneficiaries** (51.5 percent women) – about 100,000 households, in communities affected by climate change and 2,268,426 **indirect beneficiaries**[1]. Specific focus will be on vulnerable categories such as: women, women heads of households (WHHs), youth (including young returning migrants) and persons with disability (PWD).

6. **The direct beneficiaries** of the project will benefit from the promotion of climate-sensitive investments at community level, coupled with improvement in the enabling environment and georeferenced knowledge for an effective ecosystem approach; provision of grants aimed at strengthening livelihoods and enhanced resilience through market based approaches; and promotion of Productive Alliances. Besides individuals, the capacities of institutions at local and national level will be also strengthened.

i. **Institutions at the local level**, namely the stakeholders involved in the Climate-sensitive Community Action Plans (CsCAP) design, implementation, monitoring and evaluation, including Village organizations (VOs), Pasture Users Unions (PUUs), Pasture Users Associations (PUAs), Water Users Associations (WUAs), Common Interest Groups (CIGs) as well as the decentralized institutions mandated to plan, monitor and invest in natural resources (Forest Enterprises, River Basins Councils, Local Administration, Environmental Protection offices, Emergency Committees), other natural resources users groups and all relevant stakeholders and Common Interest Groups.

ii. **Institutions at the national level**, including the Ministry of Agriculture (MoA), the Committee for Environmental Protection (CEP), the Ministry of Energy and Water Resources (MoEWR), the State Forest Agency (SFA), the Food Security Committee (FSC), the Committee of Emergency situations and Civil defence (CES), Committee on Land

[1] In accordance with Annex 24: Beneficiary Estimates, GCF Funding Proposal for Community-based Agriculture Support Programme 'plus' – Phase II (CASP+)

Management and Geodesy, , the Agency for Land Reclamation and Irrigation (ALRI), Pasture Meliorative Trust (PMT), Tajik Veterinary Association (TVA), and other relevant ministries, research and educational institutions, non-governmental organizations (NGOs) and other civil society organizations (CSOs).

7. The proposed project promotes an innovative approach to leveraging investment in ecosystem-based NRM through a set of instruments by promoting georeferenced climate-sensitive investments at community level, coupled with coordinated efforts to improve the enabling environment for an effective ecosystem approach.

8. The project investments and activities will be executed through the following three technical components:

i. Component 1. Strengthening public sector capacity for transformative climate-resilient management of natural resources;
ii. Component 2. Investments in community capacity for adaption and resilience to climate change;
iii. Component 3. Strengthening livelihoods for enhanced resilience through market based approaches;

9. **Low-carbon Investment Delivery approach**. The project will support carbon emission reduction and enhance carbon sequestration potential through different ways: the implementation of the Climate-sensitive Community Action Plans (CsCAPs), including investment in afforestation, reforestation and forest restoration using Joint Forest Management (JFM); preservation of pastures and prevention of further degradation; the potential progressive reduction of the number of livestock, representing a reduction in the carbon emissions and reducing an excessive pressure on pastures. The implementation of CsCAPs and the positive results obtained from the support of agrifood value chains that integrate rural producers to markets will be amongst the main drivers for replication beyond the project. The country will thus shift from a carbon insensitive agrifood sector to a low-carbon emission economy.

II. Project Benefits

10. CASP+ will contribute to enhancing resilience of at least 100,000 rural households through climate-sensitive investments at community level, and to rehabilitate and sustainably manage about 180,000 ha of rangeland; and severely damaged forests via afforestation/reforestation (namely 5,801 ha through JFM, 1350 ha through direct afforestation and 179 ha in buffer zones). It is also expected that a total of 10,200 households will access 1020 Window 1 grants and 2,200 households will access 110 Window 2 grants. Moreover, a total of 80 FFS will be established in villages where opportunities for establishing value chain projects (Productive Alliances) have been identified. Each FFS will be active during 4 to 5 years and will train 25 participants each (2000 beneficiaries in total). CASP+ investment per beneficiary is set at about USD 30.3 per individual. Sustainability and replicability of project activities will be ensured by strengthening NRM governance at the community level and by the establishment of an improved legal and regulatory environment.

11. **Economic development.** The project will generate direct economic benefits from many of the activities that it will be financed in order to enhance the resilience of communities and households to climate risks, it is also expected to generate economic co-benefits as a result of many of its activities in the implementation of Climate-sensitive Community Action Plans (CsCAPs) and the support that will be provided to farming households in making the farming practices more resilient through FFS, provision of modern technology, assets and the links with the private sector. It is expected that quantifiable benefits would accrue from: (i) increased livestock and farm-level production and productivity; (ii) reduction of production costs due to the adoption of modern technologies and mechanized operations; (iii) higher yields and products; (iv) a subsequent increased proportion of marketed farm produce; (v) increased employment opportunities for both on-farm and off-farm activities; and (vi) financial inclusion.

12. **Enabling environment.** The policy and regulatory frameworks revised will ensure adequate capacity to respond to climate hazards, increased inclusiveness of smallholders in agri-food value chains, and improved integrated NRM planning and monitoring capacity.

13. **Environmental co-benefits.** Carbon sequestration, directly generated by the project investments on rangelands and forestry (and avoided via improved herd management), reduced land degradation and biodiversity increase are the main ecosystem services produced by the project. An ex-ante assessment of the impact of the project on the GHG emission has been undertaken using the FAO Ex-ACT and GLEAM-i tools. The net carbon balance is the difference between the gross results of With and Without Project scenarios achieved during 27 years, including 7 years of project implementation. This amount is estimated at -6,854,822 tons of CO2 equivalent of mitigated emissions during the whole Project lifetime.[2]

14. **Gender Strategy and empowering measures:** In addition to developing technical skills in (i) small livestock and poultry production or post-harvesting as well as (ii) climate resilient technologies and practices, the project will support women beneficiaries to develop (iii) household nutrition (as part of training modules delivered through FFS) and leadership for the Women Groups (WGs), Women in VOs and PUUs. Gender awareness trainings will contribute fostering more equitable gender roles and relations at household and group levels. Furthermore, through the leadership training, the project expects at least 30 percent women members and 30 percent in leadership position in the institutions/committees formed under the programme.

III. Key Assumptions for Financial and Economic analyses

15. The parameters for the models are based on information gathered during the design mission: interviews with farmers and entrepreneurs, information from the donor agencies operating in Tajikistan and the ongoing IFAD CASP, Livestock and Pasture Development Project II (LPDP-II) projects. In particular, information on labour and input requirements for various operations, capital costs, prevailing wages, yields, farm gate and market prices of commodities, input and farm-to-market transport costs were collected. Conservative assumptions were made both for inputs and outputs, and take account of possible risks.

16. **Prices.** The analysis assumed constant prices, offsetting inflation as it would affect inputs and outputs in both WP and WOP scenarios.

17. **Exchange rate.** The real exchange rate used in the financial and economic analysis is fixed at US$ 1= TJS 10.73[3].

18. **Financial discount rate.** A financial discount rate of 11.0%[4], which is the refinancing rate according National Bank of Tajikistan, has been used as financial discount rate (FDR) for the financial analysis to assess the viability and robustness of the investments at farm level. The selection criterion for the IRR is to accept all projects for which the IRR is above the opportunity cost of capital. Using the IRR as the measure, the models' sensitivity to the changes in parameters can be assessed by varying the costs and revenues. For the social opportunity costs of capital or social discount rate (SDR), the analysis has adopted a rate of 6.0%[5,6], which is a suggested social discount rate for developing countries by the World Bank.

19. **Labour.** Family labour has been valued both in financial and economic analysis. It has been assumed that both family labour and hired unskilled labour market price is TJS 40.0 per day, which has been adjusted by local unemployment rates to calculate its economic value.

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[2] Reference to Annex 23, reporting the updated carbon accounting (March 2024).
[3] As of April 2023. National Bank of Tajikistan, https://www.nbt.tj/en/
[4] Re-financing rate in Tajikistan from 10 April 2023. National Bank of Tajikistan, https://www.nbt.tj/en/
[5] The social discount rate used for the economic analysis is based on World Bank's estimations, proposed by a standardized methodology. See Discounting Costs and Benefits in Economic Analysis of World Bank Projects, OPSPQ. May 9, 2016. "Where no country-specific growth projections are available, we suggest using 3% as a rough estimate for expected long-term growth rate in developing countries. Given reasonable parameters for the other parameters for the other variables in the standard Ramsey formula linking discount rates to growth rates, this yields a discount rate of 6%."
[6] The social discount rate is in line with the discount rate used in recently endorsed two World Bank projects the agricultural and environment sector Strengthening Resilience of the Agriculture Sector Project In Tajikistan (P175952) and RESILAND CA+ Program: Tajikistan Resilient Landscape Restoration Project (P171524).

20. **The shadow exchange rate (SER)** has been calculated at US$ 1 = TJS 12.1. The goods were categorized as tradable, non-tradable and locally traded. For tradable goods, the conversion factors were calculated separately for each commodity group such as cereals (wheat), livestock (meat), fertilizers and chemicals, agricultural machinery, processing equipment, nuts, fruits, vegetables, commercial timber. Overall conversion factors for tradable goods vary between 0.96 and 1.27. For locally traded goods it was assumed that the market is at near perfect competition, so the estimated CF is 1.00. The CF for non-tradable was estimated using the shadow exchange rate factor (SERF) and is equal to 1.12.

21. More details on production and financial parameters for the models can be found in the analysis excel tables in EFA Working Paper.

IV. Financial Analysis

22. The analysis builds upon the precautionary principle, accounting for project benefits in a realistic and conservative manner. A financial analysis is carried out to present the scenarios with and without project interventions. The key-indicators used to carry out the analysis are the net present values (NPVs), financial and economic internal rate of return (FIRR – EIRR), benefit-cost ratio (B/C) and return to family labour. The analytical period applied for the financial analysis is 27 years (financial performance is also assessed for 10 years).

23. The primary objective of the financial analysis is to determine the financial viability and incentives for the project target group as a result of their engagement in project activities, and hence to examine project's impacts on family labour, financial flow and household incomes.

24. A number of indicative economic activities, which may be supported by CASP+, were identified during the design process. The analysis presents several sets of models.

25. The models show only incremental revenues and costs generated by the new investment. Incremental benefits are estimated by comparison of the without project (WOP) and the with-project (WP) benefits. In each case, the result of the investment translates into additional demand for produce from primary producers and new permanent jobs.

26. The indicative financial models can be divided into five main groups: i) adaptation investments, including investments into pasture management, climate-resilient infrastructure and agricultural machinery by implementing CsCAPs; ii) implementation of CsCAPs on forestry investments; iii) provision of grants through Window 1 which are aimed at livelihood diversification for vulnerable households; iv) provision of grants through Window 2 which are aimed at commercialisation and agribusiness development; v) investments in productive alliances greater access to markets through productive alliances between the smallholder and the private sector.

27. **Component 2 Financial Analysis.** All investments that are included in the climate sensitive action plans (CsCAPs) will be identified through participation of the local governments, local stakeholders and community members to ensure ownership with a clear plan for operation and maintenance after completion.

i. **Typical village model on Adaptation investments (CsCAPs implementation).** These include investments in *a) Pasture management; b) Climate-resilient infrastructure; and c) Agricultural machinery.* The financial model is constructed on a so-called typical village level, which includes all three listed types of investments.

   The potential benefits in this indicative model are represented by increased productivity of milk and meat and increased savings in household budget due to improved productivity of pastures near the villages and access to remote pastures. The main assumption is that the livestock inventories will be controlled and by 2030 the number of heads will be the same as it is now, whereas in WoP scenario the livestock inventories will increase by 12% with a lower productivity and higher pressure on pastures. The financial analysis of the model demonstrates a good IRR of 63.75% with NPV of US$147,540. The B/C ratio for this model is 2.29, which also proves its financial viability.

   a) Pasture investments are aimed at improving the overall productivity of pasture and limit their degradation, but also at reducing the fodder deficit in summer, amplified

by Climate Change. The pasture investment plans could include pasture restoration, rotation and access tracks and bridges for remote areas, pasture protection through fencing, reseeding, fertilization, plantation of forage shrubs and trees, access to water for livestock, summer pasture infrastructures, shepherd cabins, night fences and shelters for animals, cattle crushes for treatments, etc. This might include also cross-village pasture management investments that benefit multiple villages such as cooperation on transhumance routes, etc.

In the context of Without Project (WoP) scenario, local communities face significant barriers to investing in pasture improvement. These challenges stem from the absence of financial resources, insufficient organizational capacity (such as the lack or weakness of Pasture Users Unions), and limited technical expertise to independently develop pasture management plans. The design team has estimated that pastures under the WoP scenario, devoid of any enhancement efforts, are likely to experience a degradation leading to approximately a 15% reduction in their initial carrying capacity. However, this estimation may actually understate the severity of the situation, with potential for degradation outcomes to be even more detrimental.

b) *Climate-resilient infrastructure* includes infrastructure, addressing water stresses and the need to adapt to increasing risks of climate-related hazards. It is expected that the provided water infrastructure will help to alleviate the burden on women and increase water availability throughout the year that can also support diversification activities (backyard garden, fruticulture, small animal husbandry) and to meet basic livelihood requirements in isolated areas.

c) *Agricultural machinery* may include the following list of community equipment eligible under this window: Mowers, Hay rakes, Balers, Forager / Silage machine, Silage/haylage wrappers, Manure spreader (not only for fodder but contributes to improve soil fertility), Hay trailers (flatbed). In addition, other category of mechanization equipment that could be considered are those that can be used both for hay/fodder and other crops such as: Tractors, tillage equipment (plough, harrows, cultivator , etc…), trailers, Planters, Fertilizer spreaders (used with good agricultural practices).

ii. **Forestry investments (CsCAPs implementation).** These are operated in collaboration with leskhoz (Forest enterprises depending on the State Forest Agency), and with the participation of forest users groups, will aim to complement the restoration of ecosystems and the protection of areas vulnerable to climate hazards (disaster risk reduction), at the same time providing additional sources of income to rural communities. Forest investment will include: (i) Joint Forest Management (JFM): where a contract is created between JFM household and Leskhoz for the management (initially for 20 years) of a plot of land where the yield from the plot is split between each party to the contract;[7] (ii) Direct Leskhoz Forestry: where forest is re-established on Leskhoz land using community labour. Moreover some forestry investments will be implemented in buffer zones of protected areas: JFM will be applied through Leskhoz in the buffer zone of Protected Area (in the project area this is limited to Sh. Shohin district).

Besides specifying the modality of implementation (JFM or direct by Leskhoze), 1ha forestry models were built by different specie type, such as riparian forest, fruit and nut plantation, pistachio plantation, juniper forest plantation, juniper forest plantation with natural regeneration, saxaul plantation and agroforestry model. The direct revenues would accrue from sales of timber, fuelwood, nuts, fruit and berries collected on plantation depending on model type. The financial analysis reflects the leaseholders'

[7] In the mentioned forestry models under JFM modality the observed negative net inflow was due to the land lease cost (0.2% of the initial investment cost received by the individuals on concessional basis from the project). All the costs are covered by the initially provided grant, and the additional minor costs related to the lease agreements are covered by beneficiaries under the assumption that beneficiaries' incomes are deriving from multiple livelihoods (livestock, agriculture – unaccounted for in the specific models, but accounted for in dedicated separate models) that allow them to compensate such costs in view of the future benefits from JFM

perspective and estimated NPVs for the mentioned models vary from US$ 230 to US$ 3,903, while IRRs are in the range of 14.98% to 43.11%.

All adaptation and forestry investments under Component 2 were tested for the need for concessional financing, projecting a scenario, in which beneficiaries implement the models for their own resources without grants provided by the project. As shown in Table 1, these models are not financially viable for a range of different reasons in each particular case, e.g. negative NPV; IRR less or around the discount rate; benefit-to-cost ratio is not greater than 1 or payback period is twice or thrice higher than in with-grant scenario. This justifies the need for concessional financing.

Table 1: Component 2. Financial Analysis Summary.

Summary table. Component 2 financial models																	
					With grants (consessional financing)									Without grants (no consessional financing)			
FINANCIAL ANALYSIS	CATEGORY	Estimated Investment Costs (US$)			Annual Net Benefits (US$)			Annual Inc. net benefits per 1US$ of Inv.	IRR (%)	NPV (US$)	Benefit-to-cost ratio	Payback period (years)	Return to family labour (US$/day)	IRR (%)	NPV (US$)	Benefit-to-cost ratio	Payback period (years)
		CASP+	Beneficiary Contrib.	Total	Without Project	W. Project Full Dvt	Incremental										
	CsCAP adaptation investments (typical village)																
	1. CsCAP adaptation investments (typical village) *	78,495	8,722	87,216	60,371	91,679	31,308	0.4	63.75%	147,540	2.29	10.93	11.9	18.81%	66,470	1.58	14.93
	CsCAP forestry investments (1ha models)																
	2. Riparian forest plantation (1ha JFM model)	1,427	75	1,502	0	235	235	0.16	29.70%	850	1.67	9.0	2.1	8.70%	(412)	0.93	20.0
	3. Riparian forest plantation (1ha LH model)	1,465	77	1,542	0	238	238	0.15	13.46%	290	1.18	20.0	0.0	-0.51%	(1,418)	(0.61)	20.0
	4. Fruit and nut plantation (1ha JFM model)	764	40	804	0	680	680	0.85	43.11%	3,903	5.63	6.5	15.9	25.12%	3,225	3.57	9.6
	5. Fruit and nut plantation (1ha LH model)	1,926	101	2,027	0	456	456	0.22	38.12%	2,421	2.36	6.7	0.0	11.86%	631	2.15	11.1
	6. Pistachio plantation (1ha JFM model)	1,086	57	1,143	0	179	179	0.16	37.47%	1,274	2.15	5.7	25.7	10.95%	261	1.24	17.8
	7. Pistachio plantation (1ha LH model)	1,048	55	1,103	0	156	156	0.14	35.03%	1,070	2.01	5.9	0.0	9.79%	94	1.09	18.6
	8. Juniper forest plantation (1ha JFM model)	755	40	795	0	71	71	0.09	19.51%	315	1.35	9.2	27.6	3.73%	(397)	0.56	16.5
	9. Juniper forest plantation (1ha LH model)	755	40	795	0	74	74	0.09	14.98%	230	1.26	9.9	0.0	3.02%	(482)	0.46	17.6
	10. Juniper nat. reg-n plantation (1ha JFM model)	607	32	639	0	26	26	0.04	24.15%	705	1.89	8.0	5.5	9.69%	129	1.16	12.0
	11. Juniper nat. reg-n plantation (1ha LH model)	607	32	639	0	30	30	0.05	24.98%	729	1.92	7.9	0.0	9.96%	154	1.19	11.9
	12. Saxaul plantation (1ha JFM model)	1,859	98	1,957	0	236	236	0.12	24.51%	322	1.17	5.7	44.3	-0.09%	(1,422)	0.25	9.0
	13. Saxaul plantation (1ha LH model)	1,859	98	1,957	0	239	239	0.12	25.63%	347	1.18	5.6	0.0	0.11%	(1,397)	0.26	19.8
	14. Agroforestry model (1ha JFM model)	1,589	98	1,686	0	249	249	0.15	32.19%	1,285	1.91	7.9	4.4	10.17%	(184)	0.87	20.0
	15. Agroforestry model (1ha LH model)	1,465	77	1,542	0	252	252	0.16	32.87%	1,307	1.91	7.8	0.0	10.70%	(58)	0.96	20.0

iii. **Component 3 Financial Analysis. Provision of Window 1 grants.** The Window 1 will be for grants of up to US$ 8,000. These grants could be for, e.g. small-scale processing equipment, local storage infrastructure, community-based seed production, inputs and service provision, drip irrigation, greenhouses, nurseries, shelterbelt establishment, riverbank stability, access to renewable energy. Farmers accessing Window 1 will match the grant with a 10 percent cash contribution. For the financial analysis, the following three indicative models were selected: *a) bee-keeping; b) greenhouse; and c) drip irrigation.*

a) Bee-keeping model (new activity, WoP=0). The project will cover the cost of an investment of 10 bee families for a group of vulnerable people. The investment will include also a manual honey extractor and specific clothes to manage beehives. The grant will cover the US$ 7,945 (90% - grant, 10% - beneficiary contribution) to cover the cost of capital. This activity proven to be profitable, with a B/C ratio of 1.26, IRR of 14.90% and NPV of US$ 2,064.

b) Greenhouse model (new activity, WoP=0). The project will cover the cost of establishment of 0.09 ha greenhouse, which will be targeted at growing of vegetables (mostly tomatoes and cucumbers). The comparative advantage of such model is in seasonal prices, which are much higher than the usual ones. Such greenhouse would require an investment of US$ 8,635 (90% - grant, 10% - beneficiary contribution). The IRR is estimated at 18.46%, while NPV would be US$ 3,331. The B/C ratio for such model is 1.39.

c) Drip irrigation model (already existing plot). The project will cover the cost of investments into drip irrigation equipment to be used on open ground for production of horticultural production. Such approach guarantees a higher productivity and shifting from old methods of irrigation into drip irrigation would increase the yields by 20-25%. Such technology would require an investment of US$ 8,666 (90% - grant, 10% - beneficiary contribution). The IRR is estimated at 11.89%, while NPV would be US$ 1,419. The B/C ratio for such model is 1.07.

iv. **Provision of Window 2 grants.** The Window 2 will be for grants for CIG of up to US$ 30,000. In comparison with Window 1 grants, these grants will be for larger scale investments, e.g., processing equipment, storage infrastructure, greenhouses, solar drying facility, etc. Window 2 beneficiaries will match the grant with a 20 percent cash contribution. For the financial analysis, the following three indicative models were selected: *a) cold storage model; b) vacuum dryer model; and c) milk processing facility.*

a) Cold storage model (new activity, WoP=0). The model represents a cold storage facility with total capacity of 80 tonnes per year. The benefits will come from purchase of fruits and berries and selling them in between of seasons for a higher price. %. Such facility would require an investment of US$ 50,172 (80% - grant, 20% - beneficiary contribution). The IRR is estimated at 44.48%, while NPV would be US$ 81,682. The B/C ratio for such model is 2.15.

b) Vacuum dryer model (new activity, WoP=0). The project will support the cost of establishment of a vacuum dryer facility with total capacity of 180 tonnes/year. Such facility would require an investment of US$ 39,798 (80% - grant, 20% - beneficiary contribution). The IRR is estimated at 52.33%, while NPV would be US$ 64,685. The B/C ratio for such model is 2.44.

c) Milk processing facility (new activity, WoP=0). It is expected that the project will support the establishment of a milk processing unit with total capacity of 600 litres of milk per day. The investments costs include renovation of an existing building and purchase of all needed equipment for milk processing. Such facility would require an investment of US$ 33,282 (80% - grant, 20% - beneficiary contribution). The IRR is estimated at 42.42%, while NPV would be US$ 70,012. The B/C ratio for such model is 2.30.

d) ***Productive Alliances.*** It is expected this this will facilitate business partnerships between groups of smallholder farmers and private sector actors (e.g. aggregators, processors) on dairy and beef value chains. As an example, the analysis considers the milk collecting center model, which requires the participation of 250 milk producers, bringing an average of 4,5 liters per day in average at the beginning (3 in year 1, 6 in year 6). These 250 producers will typically come from 5 to 10 villages. Such facility would require an investment of US$ 56,307 (80% - grant, 10% - beneficiary contribution, 10% - private partner's contribution). The IRR is estimated at 60.94%, while NPV would be US$ 111,005. The B/C ratio for such model is 2.45.

The indicative models for Component 3 were also tested for the need for concessional financing, projecting a scenario, in which beneficiaries implement the activities accessing commercial loans without grants provided by the project. As shown in Table 2, these models are not financially viable for several reasons in each particular case, e.g. negative NPV; IRR less or around the discount rate; benefit-to-cost ratio is not greater than 1 or payback period is twice or thrice higher than in with-grant scenario. Moreover, there are no available loans for farmers in the financial market, while the farmers (especially Window 1 grant beneficiaries) do not have required collaterals to access the loans. This justifies the need for concessional financing through provision of grants.

The IRR represents the discount rate at which the net present value of the cash flows equals to zero. Higher IRRs typically indicate more profitable projects, as they necessitate higher discount rates to equate future cash flows with the initial outlay. For instance, in the case of beekeeping, the IRR is higher with grant, specifically 14.90%, reflecting the increased net return due to the financial assistance, while the IRR without grant stands at 11.80%. Furthermore, the milk collection center model shows an IRR of 60.94% with a grant, exceeding the IRR of 58.60% without a grant. This demonstrate that providing a grant would lead to a higher return.

Table 2: Component 3. Financial Analysis Summary.

Summary table. Component 3 financial models																	
FINANCIAL ANALYSIS	CATEGORY	Estimated Investment Costs (US$)			With grants (consessional financing)										With commercial loan (no grant)			
					Annual Net Benefits (US$)			Annual Inc. net benefits per 1US$ of Inv.	FIRR (%)	FNPV (US$)	Benefit-to-cost ratio	Payback period (years)	Return to family labour (US$/day)	FIRR (%)	FNPV (US$)	Benefit-to-cost ratio	Payback period (years)
		CASP+	Beneficiary Contrib.	Total	Without Project	W. Project - Full Dvt	Incremental										
	Window 1 indicative grant models (max. grant @$8,000)																
	16. Bee-keeping model	7,151	795	7,945	0	1,083	1,083	0.14	14.90%	2,064	1.26	7.21	26.7	11.80%	389	1.05	10.23
	17. Greenhouse model	7,771	863	8,635	0	1,403	1,403	0.16	18.46%	3,331	1.39	6.01	9.4	14.92%	1,751	1.20	8.27
	18. Drip irrigation model	7,799	867	8,666	22,589	25,551	2,962	0.34	11.89%	1,419	1.07	2.51	151.5	9.63%	-1,562	0.93	5.73
	Window 2 indicative grant models (max. grant @$30,000)																
	19. Cold storage model	40,137	10,034	50,172	0	16,261	16,261	0.32	44.48%	81,682	2.15	2.18	0.0	43.14%	71,820	2.01	9.87
	20. Vacuum dryer model	31,839	7,960	39,798	0	10,916	10,916	0.27	52.33%	64,685	2.44	3.17	0.0	55.15%	57,000	2.27	8.33
	21. Milk processing model	26,625	6,656	33,282	0	13,415	13,415	0.40	42.42%	70,012	2.30	1.65	0.0	41.45%	65,085	2.21	6.69
	Productive Alliances (max. grant @$50,000)																
	22. Milk collection center model **	45,046	11,261	56,307	0	18,640	18,640	0.33	60.94%	111,005	2.45	2.93	0.0	58.60%	104,551	2.37	7.07

A. Sensitivity analysis (financial analysis)

28. **Concessionality**. An assessment of reduced concessionality has been conducted to evaluate the main project investments at community level (component 2) as well as with the matching grant windows (component 3). Specifically, for CsCAP investment (ie, pasture management, climate resilient infrastructure, forestry, and improved agricultural mechanization) the models tested also a potential increase of the communities contributions (set at 5% for most investment, except the improved agricultural mechanization at 10%)[8]. Expectedly, the results indicate a lower benefit stream for the communities. The concessionality is set to a minimum that ensures communities to afford the required investment (provided in-kind, as labour or local material). The concessionality is also set to reflect the nature of the benefits, which include increased resilience as well as carbon sequestration via improved rangeland and forest areas. For the investment envisaged in component 3, the result is similar, indicating a reduced financial performance (IRR and NPV) at decreasing concessionality levels, across support to common interest groups (CIGs) in Window 1 and Window 2, as well as for the Productive Alliances (PA). The level of concessionality identified by the project and described in the sections above is recommended to ensure incentivizing the community investment, and at the same time guaranteeing a minimum contribution to ensure ownership.

29. **Climate scenario**. While all project investment models have been projected to reflect the consequences of climate scenario RCP8.5 (Annex 2, Chapter 1), an additional assessment was done to reflect the RCP4.5 scenario. The results reveal a stronger performance, as outlined in Table 3, below. Notably, the greenhouse model exhibits a higher Internal Rate of Return (IRR) at 19.31%, underscoring its financial viability. Concurrently, the Net Present Value (NPV) stands at US$ 4,809. The Benefit-Cost (B/C) ratio for this model is 1.42, indicating a favourable relationship between benefits and costs. Additionally, the payback period sees a reduction to 6.01 years, signalling an accelerated return on investment. All these financial models underscore the model's adaptability under the specified climate scenario.

Table 3: Summary of CASP+ financial analysis under alternative climate scenario

Summary table. Component 2 financial models																	
FINANCIAL ANALYSIS	CATEGORY	Estimated Investment Costs (US$)			With grants (consessional financing)										Without grants (no consessional financing)			
					Annual Net Benefits (US$)			Annual Inc. net benefits per 1US$ of Inv.	FIRR (%)	FNPV (US$)	Benefit-to-cost ratio	Payback period (years)	Return to family labour (US$/day)	FIRR (%)	FNPV (US$)	Benefit-to-cost ratio	Payback period (years)
		CASP+	Beneficiary Contrib.	Total	Without Project	W. Project - Full Dvt	Incremental										
	CsCAP adaptation investments (typical village)																
	1. CsCAP adaptation investments (typical village) *	78,495	8,722	87,216	60,371	91,679	31,308	0.4	63.75%	147,540	2.29	10.93	11.9	18.81%	66,470	1.58	14.93
	CsCAP forestry investments (1ha models)																
	2. Riparian forest plantation (1ha JFM model)	1,427	75	1,502	0	235	235	0.16	30.85%	1,056	1.84	9.0	2.1	9.96%	-206	0.97	20.0
	3. Riparian forest plantation (1ha LH model)	1,465	77	1,542	0	239	239	0.15	14.75%	496	1.31	20.0	2.1	0.61%	-1,371	-0.24	20.0
	4. Fruit and nut plantation (1ha JFM model)	764	40	804	0	682	682	0.85	42.68%	3,917	5.64	6.6	12.8	25.05%	3,238	3.57	10.0
	5. Fruit and nut plantation (1ha LH model)	1,926	101	2,027	0	458	458	0.23	37.63%	2,435	2.37	7.0	0.0	12.01%	645	2.17	13.3
	6. Pistachio plantation (1ha JFM model)	1,086	57	1,143	0	180	180	0.16	38.10%	1,294	2.17	5.3	4.6	11.19%	281	1.25	14.9
	7. Pistachio plantation (1ha LH model)	1,048	55	1,103	0	157	157	0.14	35.69%	1,089	2.03	5.4	0.0	10.06%	113	1.11	14.9
	8. Juniper forest plantation (1ha JFM model)	755	40	795	0	71	71	0.09	19.85%	323	1.36	8.7	13.8	4.02%	-389	0.57	16.5
	9. Juniper forest plantation (1ha LH model)	755	40	795	0	75	75	0.09	15.31%	238	1.26	9.9	0.0	3.30%	-474	0.47	17.5
	10. Juniper nat. reg-n plantation (1ha JFM model)	607	32	639	0	27	27	0.04	24.49%	718	1.91	8.0	5.5	9.97%	143	1.18	12.0
	11. Juniper nat. reg-n plantation (1ha LH model)	607	32	639	0	30	30	0.05	25.31%	743	1.94	7.9	0.0	10.25%	167	1.21	11.8
	12. Saxaul plantation (1ha JFM model)	1,859	98	1,957	0	237	237	0.12	24.95%	360	1.19	5.7	44.5	0.81%	-1,384	0.27	8.9
	13. Saxaul plantation (1ha LH model)	1,859	98	1,957	0	240	240	0.12	26.04%	385	1.20	5.6	0.0	0.99%	-1,359	0.28	19.8
	14. Agroforestry model (1ha JFM model)	1,589	98	1,686	0	249	249	0.15	33.32%	1,585	2.12	7.9	4.4	11.43%	115	1.08	20.0
	15. Agroforestry model (1ha LH model)	1,465	77	1,542	0	253	253	0.16	33.97%	1,607	2.12	7.8	0.0	11.96%	241	1.17	20.0

[8] These represent the usual practice in IFAD as well as World Bank funded projects in similar contexts of Tajikistan (eg, WB RESILAND project).

Summary table. Component 3 financial models																
FINANCIAL ANALYSIS	CATEGORY	Estimated Investment Costs (US$)			With grants (consessional financing)								With commercial loan (no grant)			
					Annual Net Benefits (US$)			Annual Inc. net benefits per 1US$ of Inv.	FIRR (%)	FNPV (US$)	Benefit-to-cost ratio	Payback period (years)	Return to family labour (US$/day)	FIRR (%)	FNPV (US$)	Benefit-to-cost ratio	Payback period (years)
		CASP+	Beneficiary Contrib.	Total	Without Project	W. Project - Full Dvt	Incremental										
	Window 1 indicative grant models (max. grant @$8,000)																
	16. Bee-keeping model	7,151	795	7,945	0	1,088	1,088	0.14	15.37%	2,228	1.28	7.21	33.5	12.15%	552	1.07	10.21
	17. Greenhouse model	7,771	863	8,635	0	1,411	1,411	0.16	19.31%	3,619	1.42	6.01	11.8	15.61%	2,039	1.24	8.23
	18. Drip irrigation model	7,799	867	8,666	22,589	25,674	3,085	0.36	7.68%	-3,326	0.85	2.51	151.5	4.96%	-6,307	0.71	5.57
	Window 2 indicative grant models (max. grant @$30,000)																
	19. Cold storage model	40,137	10,034	50,172	0	16,261	16,261	0.32	44.48%	81,682	2.15	2.18	0.0	43.14%	71,820	2.01	9.87
	20. Vacuum dryer model	31,839	7,960	39,798	0	10,916	10,916	0.27	52.33%	64,685	2.44	3.17	0.0	55.15%	57,000	2.27	8.33
	21. Milk processing model	26,625	6,656	33,282	0	13,615	13,615	0.41	42.89%	71,373	2.33	1.63	0.0	42.00%	66,445	2.24	6.66
	Productive Alliances (max. grant @$50,000)																
	22. Milk collection center model **	45,046	11,261	56,307	0	18,888	18,888	0.34	59.37%	101,433	2.33	2.93	0.0	56.65%	94,979	2.24	7.03

V. Economic analysis

30. The period of economic analysis is 27 years to account for the phasing and gestation period of the proposed interventions. The conservative scenario is presented in the analysis, and it is indicative and demonstrates the scope of profitability originated from the conditions prevailing at the time of the preparation (2nd quarter of 2023).

31. Financial prices of locally traded outputs and inputs are converted into economic prices by deducting direct subsidies, taxes and duties and using the conversion factors. Economic prices for imported inputs and outputs and/or traded goods are calculated at their border parity prices. Financial cost of unskilled labour is converted into economic one using a shadow wage rate conversion factor of 0.89. The economic cost of the project is estimated by removing price contingencies and all taxes and duties from the financial cost using, which is generated automatically from COSTAB application.

32. The illustrative models used in the Financial Analysis have been used for the calculation of the overall benefit stream, on the basis of economic prices, excluding taxes and subsidies. The overall benefit stream has been generating based on the phasing of CsCAPs implementation in 400 villages over the 5-year period and provision of grants aimed at strengthening livelihoods and enhanced resilience through market-based approaches (1020 grants through Window 1 and 110 grants through Window 2); and promotion of Productive Alliances (support of 9 models). An average adoption rate of 80% is applied to the analysis based on findings and experience of previous similar IFAD projects Livestock and Pasture Development Project I (LPDP-I) and II (LPDP-II) and consultations with other donor partners working in the country.[9]

33. Based on the benefit and cost streams analysis, the base-case Estimated Rate of Return (ERR) for the project under the With Project (WP) scenario, without sensitivity analysis on varying costs and benefits, is calculated to be 21.99%. Additionally, the base-case Estimated Net Present Value (ENPV) of the project's net benefits, discounted at a rate of 6%, amounts to US$ 173.6 million. This proves that the project is economically viable and justified and recommended for financing from the economic point of view.

34. The government contribution in taxes and duties on project investments[10] is expected to reinforce the positive stimulus to the economic activities shown in the financial models. It is expected that the various investments at community level and with entrepreneurs, besides the improvements at institutional level will ensure positive returns to the economy. In absence of data on the fiscal revenues generated by the agricultural production and rural economic activities in the target area, such benefits remain unquantified under a fiscal analysis viewpoint.

35. **GHG analysis**. The GHG analysis was carried out using EX-ACT and GLEAM-i tools. EX-ACT is a land-based appraisal system for assessing a project's net carbon balance – the net balance of tons of CO_2 equivalent (tCO_2eq) of GHGs that were emitted or carbon sequestered as a result of project interventions – compared to a "without project" scenario, while GLEAM-I has a very similar functions but focuses on assessment of intervention scenarios in animal husbandry, feed and manure management. The net carbon balance over a period of 27 years (including 7 years of implementation and 20 years of capitalization) is estimated to be 6,854,822 tCO_2-eq.

[9] IFAD portfolio shows adoption rates in line with this assumption. The completion report of Livestock and Pasture Development Project II (LPDP-II) refers also to an increase of the outreach compared to baseline.

[10] Envisaged in the project financing agreement signed between IFAD and the Government of Tajikistan for CASP+.

Overall, the project demonstrates efficiency in the achievement of its mitigation targets. The WB estimated social value of CO2e ranges between US$ 40 and 80 per tCO2-eq.[11] Such level is considered the minimum required to stay consistent with achieving the temperature goal of the Paris Agreement (WB, 2017). A more recent study provides a review of carbon pricing actually applied by individual initiatives (government, international community - 2021[12]), showing prices varying between less than 10 (30 percent of the initiatives) to over US$ 30 per tCO2-eq (20 percent of the initiatives). By taking the lowest price in this range, the project is able to generate a net present value varying between US$ 76.4 to 178.3 million (depending on the carbon pricing – respectively US$5/tCO2-eq and US$40/tCO2-eq – see Table 4).

Table 4: Project Economic Indicators with Carbon Externalities

	US$40/tCO2-eq	US$10/tCO2-eq	US$5/tCO2-eq
ENPV @ 6% (US$ mln)	178.3	90.9	76.4
ERR	23.08%	14.94%	13.58%

A. Sensitivity Analysis (economic analysis)

36. Economic returns were tested against changes in benefits and costs, different adoption and discount rates scenarios, and for various lags in the realization of benefits. In relative terms, the ERR is equally sensitive to changes in costs and in benefits. In absolute terms, these changes do not have a significant impact on the ERR, and the economic viability is not threatened by both a 20 % decline in benefits or by a 20 % increase in costs, since the ERR in both cases remains well above the discount rate. The decrease in benefits by 10% and 20% due to the combined risks of decrease of sale prices and yields accompanied by climate risks (droughts, floods, etc.) would not reduce the economic viability of the project dramatically. A mixed scenario with decrease in benefits by 30% and increase in costs by 20%, would drag the ERR down to 16.23% with ENPV of US$ 99.7 million. A 70% reduction in benefits, which can happen mostly due to severe climate disaster (severe drought, flood, etc.), would make the project economically unviable, decreasing the ERR down to 7.39% and ENPV to US$ 9.5 million. The results are presented in Table 5 below.

Table 5: Economic Analysis. Sensitivity.

Sensitivity Analysis									
	Δ%	**Risk**				**EIRR**	**NPV @6% (million US$)**	**NPV @4% (million US$)**	**NPV @8% (million US$)**
Base scenario						23.08%	178.3	255.4	124.7
Benefits	-10%	Combined risks on sale prices, yields, climate effect (droughts, floods, etc.)				21.36%	154.1	223.1	106.4
	-20%					19.53%	130.0	190.7	88.1
	-70%	Severe climate risks				7.39%	9.5	29.2	- 3.4
Costs	10%	Increase in expenses, input prices and unit costs				21.52%	172.0	248.6	118.9
	20%					20.15%	165.7	241.8	113.0
Adoption rates	-10%	Decrease in adoption rate from 80% to 70% and 60%, respectively				11.39%	51.9	90.3	26.1
	-20%					10.53%	42.0	76.7	18.8
Delay 1yr in Benefits		Delays				20.08%	159.7	234.5	108.2
Delay 2yr in Benefits						17.81%	141.8	213.9	92.8
Carbon price (US$10/tCO2)		Decrease in shadow price of carbon from US$40/tCO2 to US$10/tCO2 and US$5/tCO2, respectively				14.94%	90.9	141.7	56.3
Carbon price (US$5/tCO2)						13.58%	76.4	122.8	44.9
Climate Shock every 3 yr	20% Benefits	Repeating climate shocks				22.83%	170.4	244.7	119.0
Climate Shock every 5 yr	20% Benefits					23.09%	167.6	240.0	117.3
Mixed Scenarios		**Costs**	10%	**Benefits**	-10%	19.87%	147.9	216.3	100.6
			10%		-20%	18.11%	123.8	184.0	82.3
			20%		-20%	16.87%	117.5	177.2	76.4
			20%		-30%	16.23%	99.7	151.6	64.0
			20%		-10%	18.56%	141.6	209.5	94.7

37. **Alternative climate scenario**. The economic assessment conducted under the climate scenario RCP 4.5 indicates an increased Internal Rate of Return (IRR) standing at 23.16%, with a Net Present Value (NPV) of US$ 179.3 million. This result underscores the model's robustness within

[11] World Bank Guidance note on the Shadow Price of Carbon, 2017
[12] World Bank. 2021. State and Trends of Carbon Pricing 2021. http://hdl.handle.net/10986/35620

the defined climate scenario, enhancing its attractiveness from both economic and environmental perspectives (Table 6).

Table 6: Economic Analysis. Sensitivity (alternative climate scenario)

Sensitivity Analysis								
	Δ%	Risk				EIRR	NPV @6% (million US$)	NPV @4% (million US$)	NPV @8% (million US$)
Base scenario						23.16%	179.3	256.7	125.5
Benefits	-10%	Combined risks on sale prices, yields, climate effect (droughts, floods, etc.)				21.44%	155.1	224.3	107.1
	-20%					19.60%	130.9	191.8	88.7
	-70%	Severe climate risks				7.43%	9.8	29.6	- 3.1
Costs	10%	Increase in expenses, input prices and unit costs				21.60%	173.0	249.9	119.7
	20%					20.23%	166.7	243.2	113.8
Adoption rates	-10%	Decrease in adoption rate from 80% to 70% and 60%, respectively				11.48%	52.9	91.6	26.9
	-20%					10.62%	42.9	77.9	19.5
Delay 1yr in Benefits		Delays				20.15%	160.7	236.0	109.0
Delay 2yr in Benefits						17.87%	142.8	215.3	93.5
Carbon price (US$10/tCO2)		Decrease in shadow price of carbon from US$40/tCO2 to US$10/tCO2 and US$5/tCO2, respectively				15.03%	91.9	143.1	57.1
Carbon price (US$5/tCO2)						13.67%	77.4	124.1	45.7
Climate Shock every 3 yr	20% Benefits	Repeating climate shocks				22.92%	171.4	246.0	119.8
Climate Shock every 5 yr	20% Benefits					23.17%	168.8	241.4	118.2
Mixed Scenarios		Costs	10%	Benefits	-10%	19.94%	148.8	217.5	101.3
			10%		-20%	18.18%	124.6	185.0	82.9
			20%		-20%	16.94%	118.3	178.3	77.1
			20%		-30%	16.29%	100.4	152.6	64.5
			20%		-10%	18.63%	142.5	210.7	95.5

38. **Loan and grants-funded income-generating activities as justification**. The GCF loan request aims to strengthen the resilience of vulnerable communities by financing critical investments. The financial terms include a 0% interest rate, a tenor of 40 years, and a grace period of 10 years. The selection criteria for the activities are the following. Among the CsCAPs, GCF Loans are selected to finance the investment with the highest resilience strengthening potential and the shortest-term return. These comprise: a/ "Pasture management plans", due to their potential for rapid and substantial benefits for the communities; as well as b/ "Climate Resilient Infrastructure Investments", which are contributing to the communities adaptation and resilience and will also unlock benefits on a rapid pace. Grant financing is instead selected for other types of sub-projects, such as Join Forest Management Investments, Leskhoz Forestry Investment, and the Climate Resilient Infrastructure Investments with longer-term returns.

39. **Sustainability of the lending (under the envisaged terms)**. An ex-ante financial analysis was performed, to assess the impact for the borrower or the ultimate beneficiaries of the sovereign loan under the envisaged terms (for GCF, the loan carries 0% interest rate with repayment spread over 40 years). Given the lack of additional interest costs for the borrowers (and no repayment cost for the communities), the results would remain consistent with the ones described in the sections above, as there are no additional interest costs incurred by the communities or the Government. Consequently, both GCF-funded loans will enable the implementation of the financed activities without additional burdens either to the communities or to the borrower (Government).

40. **Additional considerations**. The ongoing conflict between Russia and Ukraine is expected to have consequences on Tajik economy, especially for the poorest segments of the rural and urban populations. This impact is even stronger as compounding to the recessional effects of the covid-19 pandemic. The restricted access to grain (wheat in particular) and fertilizers is expected to have a negative impact on the indebted economy of Tajikistan[13],[14]. In such context, CASP+ approach will not have the potential to restore the economic disruption nor the negative impact on purchasing power over food. Nonetheless, through its investment, it has a significant potential to absorb major

[13] Special report: 2020 FAP/WFP Crop and Food Security Assessment Mission (CFSAM) to the Republic of Tajikistan, https://doi.org/10.4060/cb3847en

[14] Tajik domestic wheat production covers about half of the local demand of bread and the rest is imported mainly from Kazakhstan (which is also restricted, currently). Kazakhstan imposed restriction of wheat and wheat flour in April 2022, which might be extended to September 2022, https://www.gov.kz/memleket/entities/moa/press/news/details/359468?lang=ru.

negative impacts due to its investment in rural livelihoods, especially agriculture ones, and with smallholder farmers. The highest share of project investment is directed to support climate resilience in remote rural communities targeted by the project. These areas have been often origin of migration (especially male and youth). Such investments will allow to enhance the economic activities and absorb the expected increased labour supply deriving from the return if migrant workers. Specific interventions such as the support to Common Interest Groups (CIGs) is expected to generate a positive spin to the economy.