BIOLOGICAL WASTE BY-PRODUCTION COSTS IN FOREST MANAGEMENT AND POSSIBILITIES FOR THEIR REDUCTION

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Abstract


Biological wastes in forestry were observed from view of their by-production in silvicultural and logging operations. There were identified points where biological waste was produced in this paper, waste costs ratio for silvicultural and logging operations and were made suggestions for reduction of these costs. Biological waste costs give 34.4% of total costs of silvicultural operations and 30% of total costs of logging operations. Natural regeneration and minor forest produce operations are opportunities for reduction of these costs.

biological waste, costs, natural regeneration, minor forest produce
exploitation, it has much wider range than only logging waste.

The aim of this paper is identification of points of origin, characteristics of biological waste and costs associated with its by-production or disposal and possibilities of these costs reduction.

MATERIAL AND METHODS

This analysis was made on forest property of Forest training district Vašovice for year 2002. Land area of observed forest district is 980 ha of forest land. Total production record for year 2002 (ANON., 2002) was used for identification of costs on biological waste.

There was determined cost ratio of particular operations on total silvicultural costs and logging costs on observed forest district.

Analysis of particular operations in silvicultural and logging operations was done for determination of costs on biological waste. Waste characteristics and cost determination, which are put into by-production or disposal of biological waste, succeeded to identification of waste origin points.

The cutting down methods of disposal costs were suggested after determination of disposal costs structure.

RESULTS AND DISCUSSION

Costs ratio of particular operations in silvicultural and logging operations are shown in Fig. 1 and Fig. 2. Artificial regeneration, weed control and game control took the highest part of silvicultural operation costs (Fig. 1). These three operations formed nearly 90% of total costs of silvicultural operation and they were largely related to clear cutting system and subsequent establishing of plantation.

Fig. 2 shows the situation in logging operations. The highest portion of costs was related to operations of skidding, timber hauling and harvesting. 90% of total costs of logging operation was spent on these three operations. Costs were directly connected with production of wood and timber haulage from forest stands.

1: Portion of silvicultural costs
Biological waste in forest management is produced especially in silvicultural and logging operations related to forest type in operation weed control. Pioneer tree species are the component of biological waste in operation cutting out of weed tree species. Small size trees in relation to species composition of stands, where silvicultural measure was done, are components of biological waste in operation cleaning. Died and green branches are biological waste in pruning. Percentage of costs for biological waste production by individual operation is shown in Tab. I. It is seen from results of research that operation weed mowing had the highest portion on silvicultural costs.

Comparison of costs portion on biological waste in particular operations in silvicultural operation is shown in Fig. 3. It follows from results that operation weed mowing had the highest portion on biological waste by-production costs (72%) in silvicultural operation.

It is possible to reduce weed-mowing costs by using of whole potential of natural reforestation, other method of weed control or chemical control. These proposed methods do not produce biological waste and that is why costs for by-production of biological waste are totally eliminated. The question is whether proposed methods have economic contribution and if they are friendly to environment. Especially chemical control should be use only in stands, which are not part of water conservation zone. Nature protection is also important for chemical control because biodiversity of herbs species is reduced on treated stands and also biodiversity of animal species, which are dependent on liquidated herbs.
Area for weed mowing is not formed by natural regeneration using and that is why weed mowing and by-production of biological waste is eliminated. Area portion of stands by recommended reproduction method was determined from the forest management plan for the forest district (ANON., 2001). This potential portion for given reproduction method was compared with real state at forest regeneration at 2002 (ANON., 2002). The results of this comparison are shown in Fig. 4. It is evident that potential of natural regeneration was used only at 18% of the forest district. The result of full use of natural regeneration potential is shown on subsequent model calculation.

Year grow of areas for weed mowing is 5.55 ha at average area of forest regeneration 10 ha at usage of natural regeneration potential at 45.55% of area of forest regeneration. If the calculated establishment period is 5 years then total area of weed mowing will be 27.75 ha. This area is 42.15% of weed mowing area and saving 48.41% of weed control costs.

3: Portion of costs on biological waste in silvicultural operation

4: Forest regeneration
Biological waste by-production in cutting out of weed tree species operation is possible to eliminate by not carrying out of this operation and leaving of weed tree species in stand.

Cut-offs, sawdust, branches and assimilatory organs in according to logging period are compounded in biological waste in logging operation. This waste is produced during log making as a minor product. All operations at felling, deliming, and cross-cutting at log making are jointed with by-production of waste. Theoretically, it is possible to state that all costs on operation felling are costs invested in biological waste by-production because sawdust is produced during sawing with chainsaw and branches are separated from stem during deliming. These costs are possible to reduce by minimisation of number of cuts and deliming out of stand with subsequent utilization of branches at the roadside or at timber yard. Felling costs and consumption of fuels for chainsaw are possible to reduce together in this way.

Slash disposal costs were invested in operations of collecting, chipping and burning of slash in logging operation. It is possible to mark these costs as costs on manipulation with waste and to include them to research. Structure of operations and portion of operation costs on total costs of logging operation is shown in Fig. 2.

Costs connected with by-production of biological waste created 34.4% of total costs of silvicultural operation and 30% of total costs of logging operation. These costs weight major product of economic activity from forest and reducing profit of forest owner.

Reduction of costs on biological waste by-production is one of the ways to reduce costs on log making. Market product is created at subsequent utilization of waste. Origin costs on by-production of waste will transform and will be a component of this product.

Reduction of costs on waste by-production is possible to carry out in two ways. The first possibility is maximum utilization of potential of natural regeneration. The second possibility is utilization of waste in operations of minor forest produce.

Selection of operation of minor forest produce depends on composition of biological waste. It is possible to recommend some operations of minor forest produce for operations with biological waste by-production.

Medicinal herbs harvesting is possible to use in operation weed control in accordance to floristic composition in plantation in operation.

Leaving of trees on plantation which should be utilised as a source of medicinal drugs (Betula sp., Sambucus nigra L.) it is possible to recommend in operation of cutting out of weed tree species and thus eliminate costs for its cutting out together with possibility of its utilization. Trees, which are not possible to leave on plantation, should be utilised for energy purpose.

Biological waste from cleaning and pruning is in accordance to stand suitable as a source for Christmas trees, ornamental greener or energy purpose.

It is possible to totally reduce slash disposal costs in logging operation by utilization of slash, as a source for energy purpose.

Results of this paper show that there are possibilities of cost savings in silvicultural and logging operations. Although biological waste do not weight waste management of district, it is one of significant factor in bulk of costs which affects result of economic activity at wood production.

Results of this paper are based on costs of operations, which are affected by operating costs. This fact should affect real height of costs on biological waste and its portion on total costs.

CONCLUSION

It follows from the results of this paper that costs connected with biological waste by-production and disposal are not insignificant. Endeavour of economic subjects is to organize their activity in such way to prevent unnecessary loss of funds.

Costs connected with biological waste are possible to reduce by prevention of biological waste by-production during manufacture or its utilization. It is possible to recommend maximum usage of natural regeneration with regard to character of biological waste and structure of costs on its by-production in condition of forest management. This change in management eliminates weed control operation, which has the most significant portion on these costs. It is possible to assume costs reduction on artificial regeneration in connection with increase of portion of natural regeneration.

Unused biological waste should be processed into market products in operations of minor forest produce. Number of products and possible incomes from forest will increase, and at the same time costs on production of wood will decrease. Processing of a logging waste makes a possibility to take advantage of government grant for its disposal. This is the way to prevent from loss of means on by-production and unused of produced waste.
SOUHRN
Nákłady spojené s tvorbou biologického odpadu v lesním hospodaření a možnosti jejich snížení

Biologickému odpadu v lesním hospodaření byla věnována pozornost v oblasti jeho tvorby v těžební činnosti. V této oblasti byly sledovány objemy těžebního odpadu i možnosti jeho zpracování. Z pohledu nákladů byla většinou věnována pozornost nákladům technologii zpracování odpadu.

Cílem tohoto příspěvku byla identifikace míst vzniku biologického odpadu při lesním hospodaření, stanovení podílu nákladů na tento odpad a návrh možného omezení nákladů na jeho tvorbu.

Po analýze lesního hospodaření byly identifikovány operace, ve kterých dochází ke vzniku biologického odpadu v pěstební a těžební činnosti.

V pěstební činnosti byl biologický odpad vytvářen v operacích ožínání stromků, výsek plevelných dřevin, prořezávky a vyměňování. Nákłady těchto operací se na celkových nákladech pěstební činnosti podílely 34,4 %.

V těžební činnosti byl biologický odpad vytvářen v operaci těžba dříví. Nákłady na odpad v těžební činnosti byly tvořeny nákłady na operace těžba dříví a likvidace klestu. Podíl nákladů na biologický odpad činil 30 % celkových nákladů těžební činnosti.

V pěstební činnosti byly pro snížení nákladů na nákłady na tvorbu doporučeny dvě možnosti, které jsou v souladu s trvale udržitelným hospodařením v lese. Jedná se o využití potenciálu přirozené obnovy a činností přidružené lesní těžby a výroby.

Při využití přirozené obnovy v rámci biologických možností sledovaného polesí je možné v horizontu pěti let snížit nákłady na likvidaci buřeně o 48,15 % a snížit výměru ploch pro provádění ochrany před buřením na 42,15 % současně výměry.

V těžební činnosti byly nákłady spojené s odpadem vynákládány při výrobě sortimentů dříví a při likvidaci klestu. Tyto nákłady lze omezit změnou technologie výroby sortimentů dříví a využitím těžebního odpadu v některé z činností přidružené lesní těžby a výroby.

Podstatnou část biologického odpadu vznikajícího při hospodaření v lese je možno využít jako surovinu pro některou z činností přidružené lesní těžby a výroby. Využitím odpadu se sníží nákłady na výrobu dříví a nákłady na tvorbu tohoto odpadu se přetvoří do nákladů produktu.

biologický odpad, nákłady, přirozená obnova, přidružená lesní těžba a výroba

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